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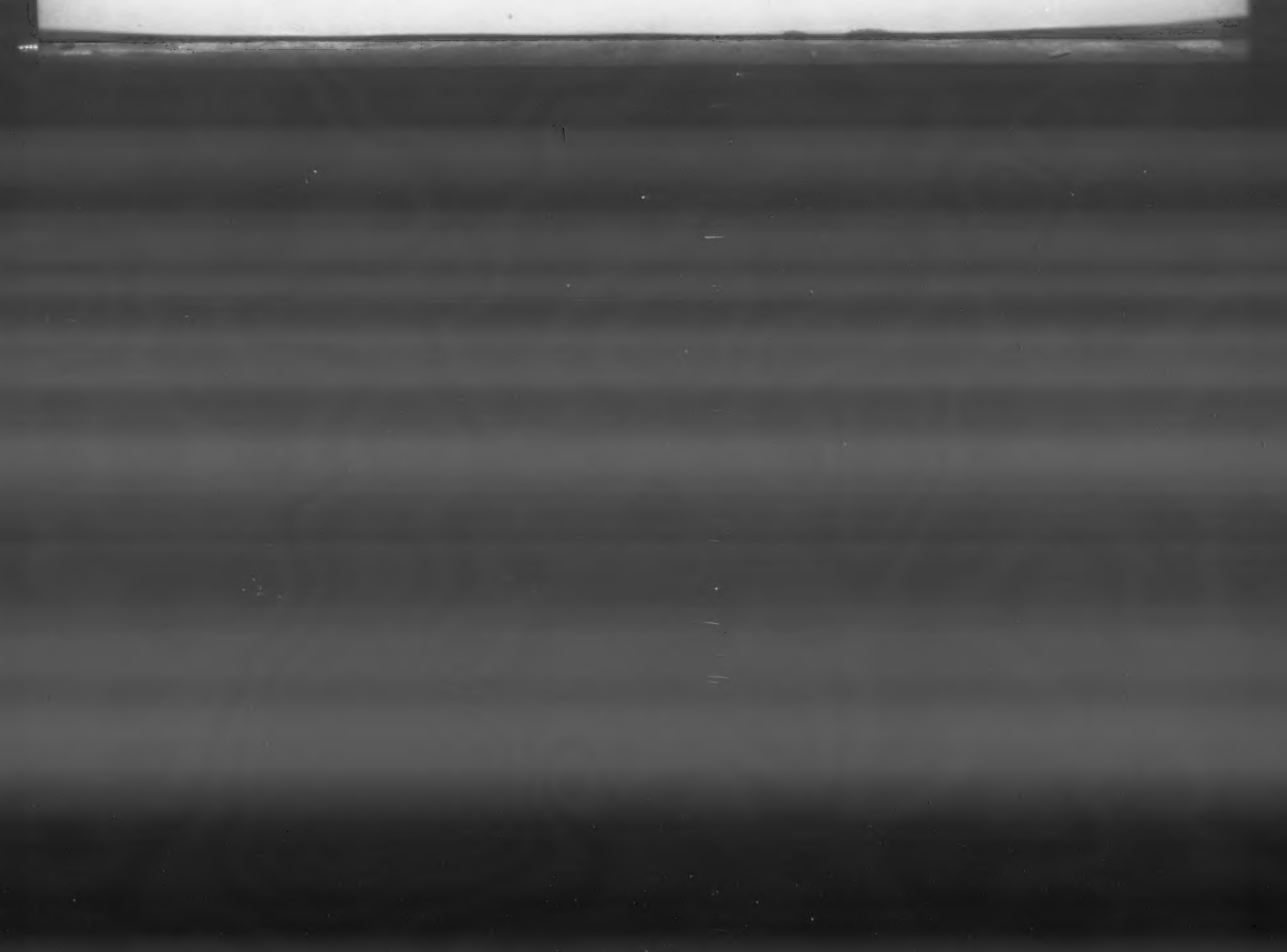

MUNICIPAL ENGINEERING

VOLUME XXIV FEBRUARY, NINETEEN HUNDRED THREE NUMBER TWO

THE CEMENT INDUSTRY AND ITS PROSPECTS FOR 1903.*

The rapid development in the cement industry in this country during the last few years leads many to ask what is the probable extent of this development, and the increase in number and capacity of factories leads others to inquire what is the prospect that there will be an overproduction at an early date.

There are many factors to be considered in making estimates of the production and use of cement even for a single year in advance, the effect of some of which is only slightly understood, but a study of the conditions of the past in this and other countries gives some basis for fairly approximate estimates of the probable extent of the trade for 1903.

With reference to the development in the manufacture and use of Portland cement in this country. The "Directory of American Cement Industries and Handbook for Cement Users" has a table derived from data of the U. S. Geological Survey from which the following is taken, the line for 1901 being added from the latest report of that Department, and that for 1902 being estimated as detailed below:

Year.	No. of Works.	Product, Barrels.	Value.
1895	22	990,324	$ 1,586,830
1896	26	1,543,023	2,424,012
1897	29	2,677,775	4,315,891
1898	31	3,692,284	5,970,773
1899	36	5,652,266	8,074,371
1900	50	8,482,020	9,280,525
1901	56	12,711,225	12,532,360
1902	60	14,400,000	14,400,000

The "Directory" gives information from which it is estimated that Portland cement was manufactured in 1902 by 60 different companies. This excludes all works making only slag cement (puzzolan) or products classed as natural hydraulic cements. If the various factories owned by the same company were considered as individuals the number would be increased by 20 or more. The average capacity of the mills, computed from the above table, increases rapidly, as follows, assuming 300 days as the length of the year:

Year.	Ave. Product of Each Mill in Barrels per Day.	Ave. Value Per Barrel at Mill.
1895	150	$1 60
1896	197	1 57
1897	308	1 61
1898	397	1 62
1899	523	1 43
1900	565	1 09
1901	757	0 99
1902	800	1 00

The consolidations, the extensions of established works and the erection of factories in new locations by companies already in business, as well as the general opinion among promoters of cement enterprises, that a less capacity than 1,000 barrels is not advisable, warrant the assumption of 800 barrels as a conservative estimate of the average product of the sixty mills in operation in 1902, or 14,400,000 barrels as the product for the year.

The domestic product did not exceed in amount the imported Portland cement until 1898, and the price was quite constant until that time. The following year there was a drop of nearly 20 cents. With the great increase in the number of works and in their capacity in 1899 and 1900, there was a further drop of more than 40 cents, with another of 10 cents in 1901. For a part of that year there was an overstocked market, but the supply has not been able to keep up with the demand during 1902. However, some of the largest works were not able to take advantage of the consequent increase in the market price, having contracted their entire product, and more, at the low prices of last winter. The average value at the mill was unquestionably higher than in 1901, so that the assumption of $1 a barrel is certainly lower than the official report will show when it becomes available.

With these facts in mind, an estimate can be made from the manufacturing standpoint of the production for 1903. The Directory of American Cement Industries supplies information on which to base the estimate of the separate companies manufacturing cement during

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most of 1903, if present conditions continue. Purchases of existing works by other companies, the large increases in production by several companies in works now under construction or very recently completed, and the large size of the new plants just coming into operation warrant an increase in the average daily capacity of mills to 900 barrels a day, with a probability that 1,000 barrels will be nearer correct. This makes the total estimated product for 1903, 19,440,000 barrels, worth at the mill over $20,000,000.

It is probable that the estimated product for 1902 is smaller than the actual manufacture, for the works were pushed to their utmost in many cases to keep within reasonable distance of their contract requirements, while in 1901, on which the estimate for the past year was based, the over production for a part of the year had a pronounced tendency to restrict production during the remainder of the year. If present trade and building conditions continue, the estimate for 1903 is also conservative.

This supply will not be furnished and marketed unless the demand calls for it, and an estimate of the demand must also be made. This is not so simple a matter for the reason that statistics showing the actual uses made of cement are not available, and the new uses to which cement is put in this country are increasing in number so fast that, with the fullest statistics estimates would be very conservative, if based only upon them. The condition of the money market and of trade will have great influence upon building operations and upon public improvements, railroad betterments, bridge and dock building and other fields for the use of cement. Only in general terms, therefore, can any comparisons be made with past years and with conditions in other countries.

As to the use made of cement in this country, it may be said the merest beginning has been made. The present trade is the development of less than ten years, and, while it is enormous, the possibilities—the probabilities—are vastly greater. The production of Portland cement per capita of the population in the year 1900 was 42 pounds. It is said that Germany produced about 20,000,000 barrels of Portland cement in 1900, or 135 barrels per capita. If the United States produced cement in the same proportion, its annual product of Portland cement would be over 27,000,000 barrels. Germany makes many more uses of cement than this country has yet fallen into the habit of, but most of these uses are now developing here and new ones are being found almost daily, so that in a very few years the consumption in this country will exceed that in the older land, per capita as well as in total amount. Present conditions of growth continuing, therefore, it will evidently be some years before the capacity of cement mills will approach close enough to the demand to cause more than temporary overstock of the domestic markets. The inability of the domestic manufactories to supply the demand in 1901 is indicated by the large increase in importations in the months from August to November, inclusive, as reported in the "Monthly Summary of Commerce and Finance" of the U. S. Bureau of Statistics. The figures in the following table show clearly when the shortage began to be felt. While all kinds of hydraulic cement are included in the figures given, the amount imported of natural hydraulic cement not equivalent in quality to the cheaper grades of Portland cement is not sufficient to affect the result materially. The pounds in the reports are reduced to barrels of 380 pounds.

IMPORTS OF CEMENT BY THE UNITED STATES.

	1901. Barrels.	1902. Barrels.
June	96,530	113,400
Twelve months ending June	1,681,000	1,115,400
July	110,640	109,400
August	60,320	190,460
September	104,080	319,930
October	137,270	472,020
November	125,790	308,730
Eleven months ending November	907,130	1,892,410
Four months ending November	427,460	1,291,140
Twelve months ending December	944,592	.....

Twelve months ending June, 1900, 2,480,440 barrels.

Eleven months ending November, 1900, 2,310,240 barrels.

A study of the table in the "Directory of American Cement Industries" showing the consumption in this country of domestic and foreign Portland cements shows the slow development of the use of this class of cement prior to 1898. The high price of cement, as shown in one of the tables above, was one of the principal causes of delay, as it restricted the experimentation necessary to learn the properties of the cement. The recognition of the value of Portland cement began the rapid increase in its use notwithstanding the price in 1898, but the increase in the capacity of works was so much more rapid than the spread of knowledge regarding the use of cement that the price rapidly fell until it reached what is probably the minimum for some years, in 1901. At the prices then prevailing it entered into competition with natural hydraulic cement, and thus the knowledge of its uses spread so rapidly that the overproduction of 1901 was changed

GRAND STAND AT CINCINNATI BALL PARK. CONCRETE-STEEL CONSTRUCTION.

into the great shortage of 1902, that year's increase in capacity of works being more than covered by the increase in demand. From an average importation of about 2,100,000 barrels a year for 1897 to 1900, there was a falling off to 944,000 in 1901, but a recovery in 1902 to the imports of the previous four years.

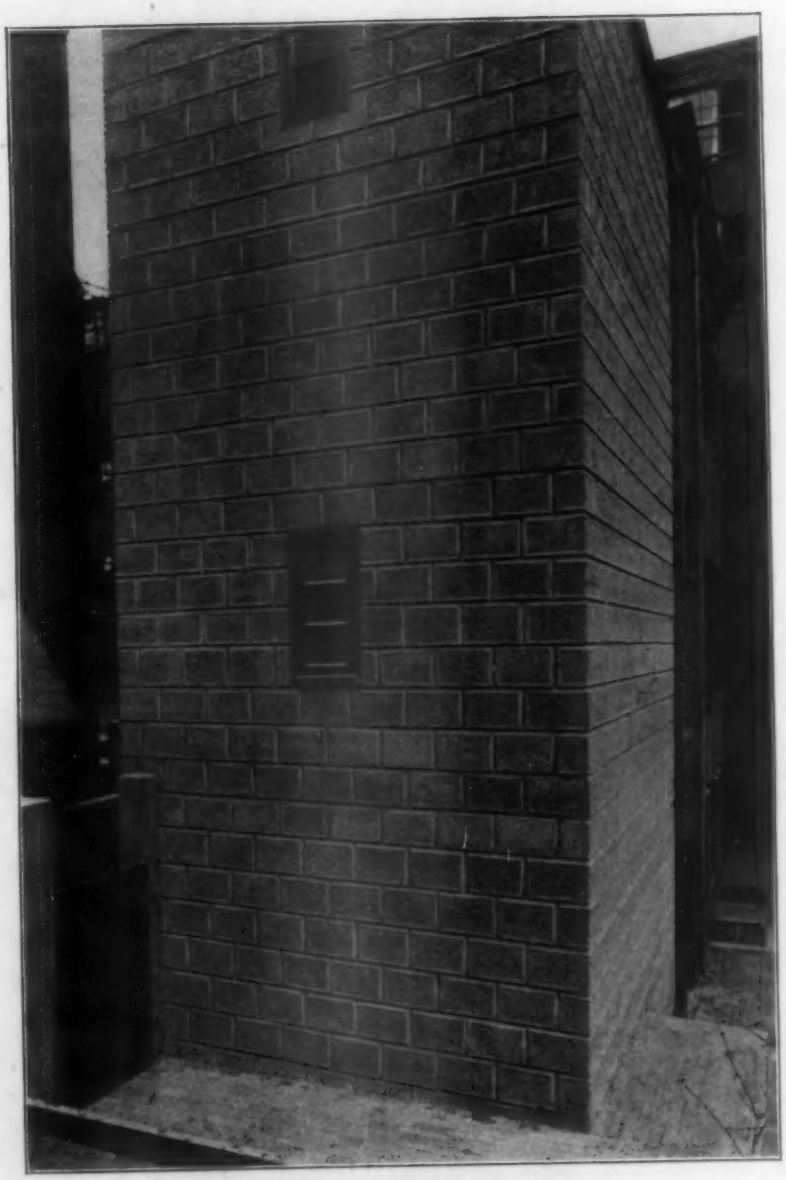
The export of cement has scarcely begun, being 36,732 barrels in 1898 and 139,939 barrels in 1900. It increased to 400,000 barrels in 1901, and the report for the first eleven months of 1902 shows 332,000 barrels exported. There is a large field here for cultivation. Germany exported about 3,500,000 barrels in 1900.

Regarding the principal uses of cement. The cement sidewalk was long one of the principal consumers of cement. While the number of barrels used for this purpose has largely increased, it now has a number of sharp competitors for first place. Small towns which have no other paving improvements are now supplying themselves with cement walks, and there is an enlarging field for this use of cement, both in new towns in which the fashion has not yet been set and in additions to the miles now laid in the larger towns and cities. It will be many years before the maximum use of cement for this purpose is reached. Allied with this use is that for basement floors, area ways and doorways. Here also there is opportunity for great expansion, limited only by the price of cement, a low price greatly increasing the demand for this class of pavement. Fire-proof cellars and partitions, with and without steel reinforcement, are also great users of cement. Concrete-steel is very new in this country and the development of this method of construction is unlimited. Bridges, abutments, arches and culverts are planned as concrete structures in rapidly increasing numbers, and if cost of cement does not put their price too far above that of stone, steel, wood or brick, hundreds, perhaps thousands, will be built each year. The railroads, which are very conservative in adopting new methods of construction, are adopting concrete to the exclusion of other materials in many classes of their structures from culverts to railroad stations of the best architectural designs. They have taxed the capacity of several cement works during the past year under contracts made a year or more since, and will consume still more next year. Very few concrete buildings were in existence in this country prior to 1900. The number is increasing each year in geometric ratio. Artificial stone blocks for building and ornamenting buildings are inventions of the last five years or so and are only beginning to secure recognition for being as satisfactory for their durability, adaptability, strength and appearance as for their economy. The last year has been the first full year since the experimental stage was passed. This method of construction will often displace brick and wood, either on the score of cheapness or safety and durability. The amount of cement to be used in making these blocks can not be estimated. It is certainly very large, being subject to geometrical progression for a number of years if the supply of cement is near enough the demand to keep its price within reach. When the price of Portland cement is low enough it displaces natural hydraulic cement in concrete for pavement foundations, for sewers, buildings and other structures. The amount used for these and other purposes for which natural hydraulic cement is suitable will fluctuate with the price of cement. Many other lines for development of the use of cement might be followed out but space will not permit. The simple list takes a full page in the "Directory of American Cement Industries," and the descriptions of the methods of use occupy many pages.

The search for suitable materials for making Portland cement is resulting in a wide distribution of the industry. Some of the largest companies have recognized the fact that ultimately the question of freight rates will be one of importance in making choice of a cement, and are constructing mills in different parts of the country. This phase of the subject is discussed in vol. xx of Municipal Engineering, page 270. Except for a portion of the year 1901, when prices of cement at the works ran dangerously near the cost of manufacture in some works, it has not yet been of great importance.

It is well to study the condition of the cement trade in Germany in 1901, as an indication of what may happen to the industry in this country under similar conditions. Some observers felt that this country narrowly escaped the same troubles in 1901, but further study shows that the dull time in that year served to hasten the development of the industry, as outlined above, and to set some distance ahead the probability of an occurrence of the German conditions.

In general and approximate terms it may be said that the capacity of German factories in 1900 was commensurate with the consumption and export in that year of about 20,000,000 barrels. In 1901 great financial depression restricted building operations so that there was a falling off in the domestic use of cement of something like 6,000,000 barrels. At the same time the development of cement industries in the United States, Russia, Austria and elsewhere restricted German



CONCRETE STEEL STORAGE VAULT.

exportations and even caused an appreciable increase in importations in special districts. The use and export of cement in 1901 may then be stated to be approximately 14,000,000 barrels. At the same time a large number of new companies were ready to furnish cement and many of the older companies had largely increased their capacity so that it is said that 30,000,000 barrels could have been made in 1901. This great excess in capacity had its natural result in low and feverish prices and greatly reduced profits. A table in the "Directory of American Cement Industries" shows the effect in reduction of dividends by a number of companies. The average of the dividends of the seven companies given in this table was 14.2 per cent. in 1899, 9.9 per cent. in 1900 and 4.5 per cent. in 1901. Two of the companies passed their dividends in 1901, having paid 10 and 7 per cent. in 1900. This experience is valuable, though the facts that the discrepancy between supply and demand is in the other direction in this country and our export trade is negligible, indicate that the same condition will not affect our cement trade for some years, if ever.

This is a case in which there is danger in too conservative estimates of production. It is well, therefore, to call attention to the fact that both in this country and in Germany the total capacity of works, as reported to the "Directory of American Cement Industries" and the "Adressbuch der Cement - Fabriken Deutschlands," by the managers of the works is perhaps 40 per cent. greater than the estimates above stated. The actual output seldom if ever equals the maximum capacity given, even for years of greatest activity, as it is not probable that any plant operates with any close approximation to its estimated maximum capacity for an entire year, so that the estimates of production are believed to be but little less than the actual output will be.

CONCRETE BUILDING CONSTRUCTION.

We present this month illustrations showing a number of applications of concrete and concrete steel to building construction of various kinds with special reference to their use in exterior walls.

The grand stand at the Cincinnati base ball park, Plate I, is an example of the substitution of concrete steel for wood construction. It is evident from the photograph that the same design might as readily have been constructed in wood. The increase in durability, strength and safety warranted the increase in cost.

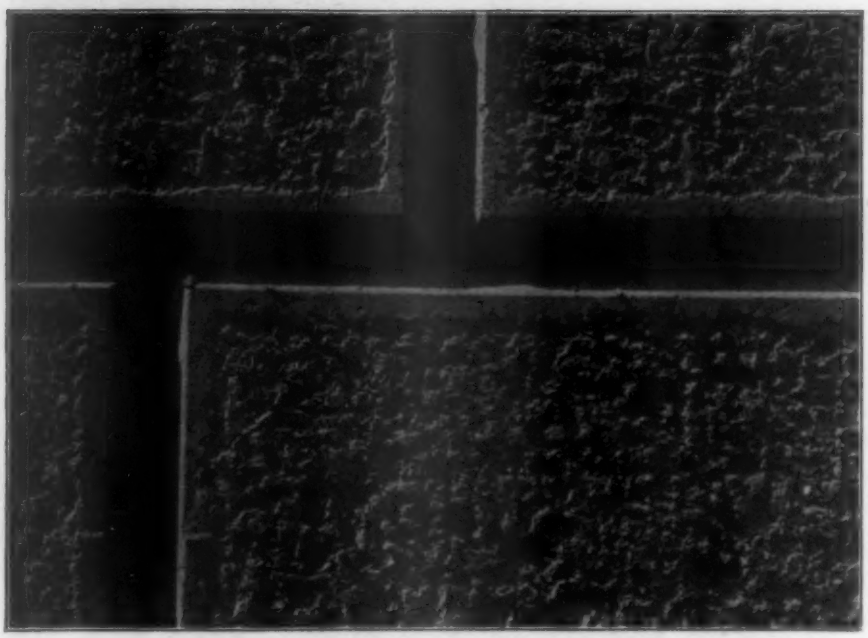
Another simple application of this method of construction is shown in the view of the three-story concrete-steel fireproof storage vault of the Calumet & Hecla company in Boston, in Plate II. The detail of the block-like face of the wall is shown in Plate III, and that of the wall construction in Plate IV.

Plate V shows the factory of the Pacific Coast Borax Company's refinery at Bayonne, N. J., after a fire which consumed all combustible material inside the building. Copper and cast iron were fused by the heat. A structural iron annex was wrecked by the giving way of the metal on account of the heat, though in itself incombustible. The concrete walls and floors were practically uninjured, as they are not only incombustible, but also fireproof. The good condition of the walls is shown in Plate V, and also on a larger scale for a small section in Plate VI. The latter plate gives evidence of the strength of the concrete-steel floor also. The ruined tank shown was supported on the wooden roof of the building. When that burned the tank fell to the top floor, doing it little injury aside from punching a hole in the floor and cracking a beam. When it is known that the tank weighed eighteen tons and fell fourteen feet, the value of the floor is fully demonstrated. Other tanks fell without doing any damage.

Plate VII shows a small laboratory building in New York and Plate VIII an elaborate church building in Brooklyn built on the Ransome system of concrete-steel construction. A still more elaborate front of the same construction is shown in Plate XI, a view of a college fraternity chapter house at New Haven, Conn. Plates X, XI and XII show buildings in Honolulu of concrete-steel.

These views are given by courtesy of the Aberthaw Construction Company of Boston, who use the Ransome system in New England. They are excellent examples of concrete work and show what architectural effects can be obtained. There are several other systems of concrete-steel construction and of plain concrete, monolithic and in block form, which are obtaining similar results.

The methods of construction of walls of buildings are in brief as follows: A wooden form is erected, consisting of slotted standards made of six-inch boards nailed together with spacing blocks between them at their ends, ¾-



DETAIL OF SURFACE OF CONCRETE-STEEL STORAGE VAULT.

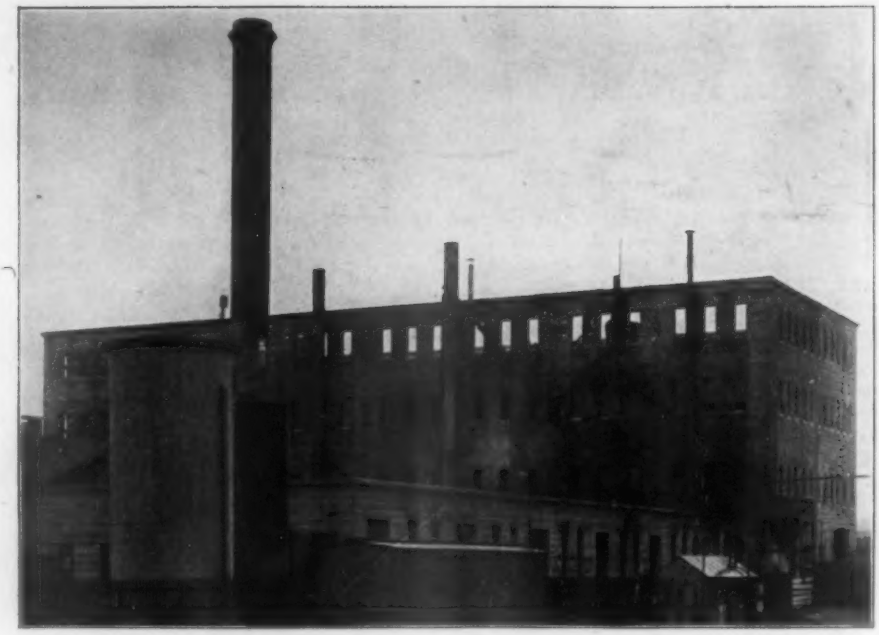
WALL CONSTRUCTION OF CONCRETE-STEEL STORAGE VAULT.

inch bolts to join the standards on opposite sides of the wall, and moldboards between the standards and the wall. The bolts have large cast iron washers at one end, attached by means of a clamp bolt, and the other end is threaded for a hand wheel and washer. To start the wall, the standards must be braced in position, but after it is carried up the hight of the standards the forms are lifted up about half their hight and the wall serves to keep the forms in place and thus keep the wall plumb. Very little staging is necessary. Plate XIII shows the form in place on a wall and gives very clearly the construction of the standards, the rods and the form boards used.

Since a concrete block is much stronger than a brick wall of the same dimensions, it is customary to leave vacant spaces in concrete walls, and especially in walls of concrete-steel construction, thus reducing the cost quite materially. This construction also insures a dry wall and a more uniform temperature inside the building. If the holes are arranged as tubes or flues, pipes and wires can be run through them to advantage. The cores used to form the vacant spaces are plain wooden boxes which can be raised after the cement has set. Collapsible metal or wooden boxes may also be used. In concrete-steel construction bars or netting are embedded in the faces of the wall with connections between the faces at intervals in the concrete partitions between the hollow cores. From one-third to one-half the cross section of a wall can be left vacant according to the system of construction adopted. The method of forming the hollow wall is shown in Plate IV.

It is customary to plaster directly on the concrete wall for inside finish, the dryness of the wall and the character of its surface making furring and lathing unnecessary. The slight absorption of water by a concrete wall is an additional reason for its dry nature.

The color of a concrete wall usually approximates that of Bedford stone, but it can be varied to suit the taste by selecting the proper aggregate and dressing the surface so that the particles of the aggregate can be seen. The texture and appearance of the stone can be varied by using different tools and methods of dressing. This process also removes form marks, defects in placing material and other imperfections. When a wall is to be plastered it can be left somewhat rough that the mortar may stick. The outside surface is usually worked into a hard, smooth mortar surface whether it is to be dressed or not. A common mistake of concrete building constructors is to use the concrete in imitation of stone faces which are impossible of imitation. Thus any attempt at a rock or quarry face is bound to meet with failure, studied irregularities not being comparable in beauty and naturalness with those of the stone broken from the quarry. The fundamental principles of art in architecture prohibit such imitative attempts, and the results of violations of these principles are always objectionable. Artificial stone requires designs which are themselves artificial. Imitations of cut stone do not usually meet with the same condemnation as imitations of natural conditions, because these forms are nearly all of them equally well adapted to both materials. Such constructions as the grand stand shown in Plate I are as yet in the doubtful class so far as their architectural features are concerned. If concrete is to be considered as stone, to which its surface most nearly approximates in appearance, then this structure violates all the principles of architectural beauty. But concrete-steel is apparently well adapted to this class of construction, and if a design is developed which is original, and properly adapted to the material and the method of construction, not imitating structures in other materials, then, while it may be necessary to adjust one's self to the new materials and conditions, the fundamental honesty of the structure and the proper adaptation of the materials to the work they must do make it architecturally correct. The grand stand in question seems to be too close an imitation of a design for a timber structure to be entirely satisfactory from the architect's point of view, but from the builder's standpoint it is excellent as a demonstration of the possibilities of the material in this direction.



REFINERY OF PACIFIC COAST BORAX COMPANY AFTER FIRE.

REFINERY OF PACIFIC COAST BORAX COMPANY, SHOWING WALL AND CONCRETE FLOOR AFTER FIRE AND FALL OF TANK.

ELEVATED AND SUBWAY ELECTRIC RAILWAYS IN PHILADELPHIA.

By William B. Bray, Philadelphia, Pa.

The city of Philadelphia meets and must solve the problem of rapid transit for its one-and-a-half millions of residents. This is a particular necessity for that city, owing to the wide area over which it is spread—129.583 square miles.

While the city has had for nearly ten years one of the most complete systems of surface trolley lines, the increasing traffic and the tendency toward concentration of business within a comparatively few squares have resulted in the overcrowding of cars, occasioning such delays that frequently an hour is consumed in traveling five miles or less. The surface lines on the main thoroughfares, such as Market, Arch, Chestnut and Walnut, become seriously congested at the rush hours. There are many lines coming from outlying sections of the city that converge upon these main streets, running through the business portions. The Philadelphia Rapid Transit Company has within a few years consolidated all of the independent companies of the city and has been granted sweeping franchises by city councils to extend their lines to nearly every street and alley throughout the entire city. This practically bars competition for all time but has given the city a most complete system of trolleys.

But even with all their chances for diverting traffic from one street to another the company finds it impossible to carry passengers as rapidly or comfortably as they or the public desire, and the only solution of the difficulty is in resorting to subway and elevated tracks on the thoroughfares most used. Ordinances have accordingly been passed by city councils granting to the Market-st. Elevated Passenger Railway Company, really a subsidiary company of the Rapid Transit Company, privileges for subway and elevated lines on several of the principal streets in the heart of the city, and extending on one thoroughfare to the city limits, a distance of six and a half miles.

Some opposition was anticipated to these ordinances because of their contemplated disfigurement of portions of streets by elevated tracks, but the demands for increased and more rapid transit facilities were recognized and practically no difficulty was encountered in granting the franchises, except for a feeble but unsuccessful effort in councils to reserve to the city the right to recover the franchises in fifty years or to draw revenues from the same when they proved highly profitable, as is done in some cases in New York and Boston. A clause in the original draft of the bill giving the Subway company rights to rent conduits to electric power and light and to telephone companies, etc., was stricken out as being inimical to the interests of such industries and outside of the line of a traction company.

The general provisions of the ordinance are very liberal. They convey a right to pass under any and all streets, to go around the public buildings at Broad and Market-sts., to erect stations at points not more than half a mile apart, and to remove city sewers, water pipes, gas mains and conduits of all kinds in the way of the lines of the tunnel, provided the same are restored in the same condition as when disturbed. This is one of the most serious propositions confronting the subway company, as Market and Walnut-sts., two of the thoroughfares that are to be tunneled, are literally honeycombed with sewers, mains and pipes of all kinds, some of which have lain for nearly a century. This was an obstacle that caused the city much trouble a year ago in laying its high pressure fire mains system.

Borings have been made along the route of the proposed tunnels and workable ground is found to exist. The company's engineers are preparing plans for the entire system of the subway and elevated lines to connect with existing surface lines and work will, it is expected, be begun early in the spring if not before.

Their plans, so far as they have been given out, call for a stone subway built after the most approved methods, to be located as nearly as possible in the center of the streets. The crown of the tunnel must be of a character to support thoroughly the street and secure it against any possibility of subsidence, and it must conform to any grade of streets under which it passes. Work must be begun within a year of the time of passing the ordinance and the lines must be completed within three years of the time when it is started.

One of the most difficult and perplexing features of the structural work was planning for bringing the line out of the subway at its western terminus to cross the Schuylkill river. At first it was proposed to tunnel under the river, but this was blocked by solid rock, so the project was abandoned. It was then decided to build a separate bridge for the trolley cars, between Market-st. and the

ROBERT A. VAN WYCK LABORATORY, NEW YORK.

ST. JAMES CHURCH, BROOKLYN, N. Y.

Pennsylvania railroad bridge. The trolley cars will emerge from the tunnel at the eastern bank of the Schuylkill and ascend an incline to the western bank, where some cars will proceed by an elevated line out Market-st. to the county line, the others returning to the surface lines.

The general plan of the new system is as follows: A sub-way under Market-st., from the Delaware to the Schuylkill river, a distance of twenty-three squares. There will be double tracks for fourteen squares, and four tracks for the balance of the distance, due to meeting of loop lines traveling under Walnut and Arch-sts., for nine squares, crossing the main artery of Market-st. at Fifth and joining it at Broad-st. The loop on Arch, Walnut, Fifth and Broad-sts. is to relieve the traffic in the crowded portions of Market-st. The plan also provides for an elevated system on Delaware avenue along the river fronts, for a mile, connecting with the subways, leading to the wharves and ferries. The present surface lines will be preserved, the sub-ways and elevated tracks being for express car service. The new lines, it is estimated, will cost from $10,000,000 to $15,000,000. The rate of fare cannot exceed five cents and electric motive power must be used.

Just before going to press word was received that the directors of the Philadelphia Rapid Transit Company had adopted general specifications for the construction of the Market-st. subway. It was decided to carry on the work in sections so as to obstruct traffic as little as possible. The specifications provide that sidewalks, streets and car traffic shall not be interfered with whenever avoidable. Owing to the depth of the subway, which will be twenty-four feet, some streets, however, will be closed for a time. The section first to be built will be seven squares long, from the west side of City Hall to the Schuylkill river, via Market, where four subway tracks will be laid. Although admitting that the plans for the entire system are well in hand and that bids for the first section will soon be asked, President Parsons would not say just when work will be started. One of the latest difficulties confronting the engineers is an eight-foot sewer in Walnut-st., where one portion of the subway "loop" is planned to extend for nine squares. They may be obliged to change the plans to use Chestnut-st., the "Broadway" of Philadelphia.

COLLEGE FRATERNITY HOUSE, NEW HAVEN, CONN.

EDITORIAL COMMENT

Who Shall Pay for Highway Construction?

Prevention of Pollution of Streams.

Engineering Etiquette.

Rates for Municipal Service.

WHO SHALL PAY FOR HIGHWAY CONSTRUCTION?

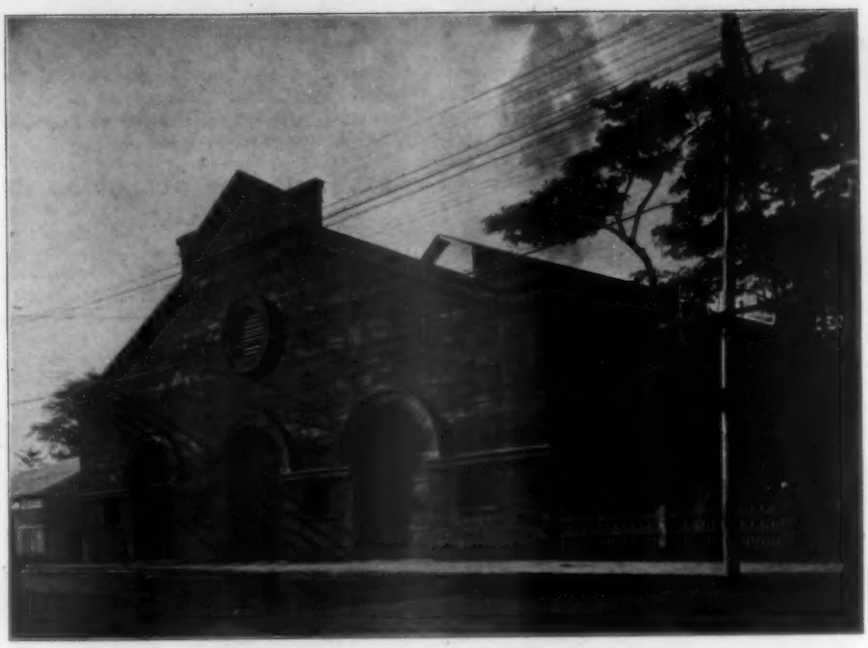
In view of the numerous methods of paying for highway construction now proposed, it may be well to ask what principles should govern the selection of a method. There is great variety in methods at the present time and they do not conform even remotely to any rule or set of rules. The road question has been largely a local one, but the expansion of means of communication, the improvement in road vehicles and methods of propelling them, the rural free delivery and the general advance in rural conditions and demands are rapidly making the question one of more widely extended importance. The present article will be confined to a consideration of some of the principles underlying the application of aid from the National Government to the building of highways. It is prompted at this time by the character of some proposed legislation.

In the years following 1811 the United States Government constructed the National Road which, while sections of it were never completed, may be considered to have been 700 miles long and to have cost $7,000,000, the National Government paying the entire expense. At that time this road was an essential to the development of the country west of the Alleghenies and its construction by the government was justified on that account. The cost of repairing the road was not so easily obtained from the government and a proposition to collect such cost from the traffic over the road by means of tolls was vetoed by the President on the constitutional ground that it imposed duties on interstate traffic, an interpretation which would not now be made. The doctrine of sovereignty of the states prevented further expenditures of this sort for many years. The increasing power of the central government and the insidious influence of such growths as the river and harbor bill, much of which is merely an annual raid upon the treasury, have worked together to reduce the objection to national expenditures for local purposes.

The government did not pay any further attention to the question of road construction until the establishment of the Office of Public Road Inquiry about ten years ago. This office is in line with many other divisions of departments in the government service in securing and distributing information regarding road building and maintenance, educating the people in this respect, and its appropriations are eminently proper expenditures of public money. But now comes the Brownlow bill, reviewed on page 22 of the January number of Municipal Engineering, which goes farther than any other measure in its application of national funds to local uses. It makes no pretext of promoting interstate commerce, but proposes to appropriate money for roads on application of states, counties or townships, the only check upon the character of the road to be improved being the opinion of the Director of the Department. Its advocates point to the river and harbor and the public building appropriations as one reason for the new raid upon the treasury, saying: "There are many rural districts that have no great rivers or great harbors or great cities which entitle them to public buildings, but there is no district but that has many miles of public roads that need to be permanently improved. Let the people ask for it and they will receive the assistance which they desire and deserve."

As an additional argument they point to the appropriations made to Porto Rico and the Philippines, thus: "It is a remarkable fact that the United States Government has already appropriated a million dollars to Porto Rico for road building and another million to the Philippine islands; and the Secretary of War has just made an appeal to Congress through the president of the United States, who strongly endorses that appeal, to have three million dollars appropriated for the use of the Philippine Government."

It is generally recognized that these new dependencies of the United States must, for the present at least, be treated in a paternal manner similar in theory to the treatment of the Indians, and that, while special appropriations may very properly be made for feeding, clothing, housing and schooling Indians and Filipinos, and for local improvements which



HAWAIIAN AUTOMOBILE CO., HONOLULU. CONCRETE-STEEL BUILDING.

CLUB STABLES, HONOLULU. CONCRETE-STEEL.

they are unable to make, a similar exhibition of paternalism with reference to the States of the Union should be strongly resented as a reflection upon their ability and an insult to State pride, as well as a violation of one of the fundamental principles upon which the form of the union of states is based.

It is hardly probable that so serious a departure from the unwritten constitution, even if it is not a violation of the letter of the basis of our government will pass the representatives of the people in Congress assembled. But the subtle influence of the special appropriation of national funds under the cloak of legitimate measures for the improvement of navigation, the provision of buildings for doing public business, and the pensioning of the defenders of our country, as well as special provisions for our dependent wards at home and in our new possessions, seem to have blinded the eyes of public officials, of societies intensely interested in road improvement, of citizens generally, to the true import of such a measure.

The rapid improvement of our roads in these days of extension of steam and electric roads is not worth the abandonment of so definite and so valuable a principle.

One argument of the supporters of the bill is that the work of the Office of Public Road Inquiry "is in the nature of national aid" and that "there is, therefore, nothing new in principle in the bill recently introduced in congress by Col. Brownlow of Tennessee providing for national aid of a more extensive and substantial character." The assistance of the government in the way of educational work is very different in principle and practice from the assistance proposed in the bill and its value and its entire conformity with the principles of our organization are recognized by all. The fact that it is given cannot by any stretch of reason or imagination be twisted into approval of the proposed extension. The simple statement of the quotation shows this to any student of the principles of American government.

It may be admitted that the government, in aid of interstate communication, may build or assist in building through roads between centers in different states, though many will deny the power of the national government to do this, but this is expressly not the purpose of the bill, which would not prevent the application of national aid to the least valuable road of a mountain township if the opinion of the director did not stand in the way. A proper measure offering national aid to road-building is not impossible and will receive ample support. The objection made at present is to the form and the violation of established principles in the present bill. The principle of a proper measure can best be considered together with the question of state aid.

PREVENTION OF POLLUTION OF STREAMS.

The United States Geological Survey has assigned to some of its hydrographers, in connection with their work upon the measurement of the flow of streams and investigation of their economic value, the consideration of the danger to the latter from the various forms of pollution. One of the first published reports of the work of this character is No. 72 of the series of Water Supply and Irrigation Papers, which discusses the sewage pollution of the area near New York City and its effect on inland water resources, Mr. M. O. Leighton being the author.

After definitions of normal waters and of polluted waters from the standpoints of various uses, the author considers very briefly the Raritan and Passaic rivers and their tributaries in New Jersey, and in somewhat more detail the Hudson river and its tributaries in New York. The limitations of space in this series of papers prevent much detail in a district which has been more thoroughly studied than any other of like area, so that the lack of information is not to be criticised. It is all taken from published reports which are named, so that further detail can be found if needed. Mr. Leighton is now engaged upon inspections and collection of data regarding streams in the Mississippi valley.

The Indiana Engineering Society took up last year the consideration of this important question and presented some general data regarding sources of pollution in the state and the legislation and decisions of courts on stream pollution in Indiana and other states.

Mr. Leighton presented a paper to the recent meeting of the society, an abstract of which will be found elsewhere in this number. It is entitled "Stream Pollution and Remedial Policy." Some members of the society are advocates of the process of passing prohibitory legislation and requiring the industry or city polluting the stream to make the experiments necessary to instal a proper system of purification, believing that only in this way can sufficiently rapid progress be made. It will be seen that Mr. Leighton favors a policy of assistance in the solution of the problems, offered by the state, thus sharing slightly the burden which the factory or city must carry. It developed in the discussion that he would not close up an industry which was polluting a stream until it was shown that it would be im-

PUNAHOU PREPARATORY SCHOOL, HONOLULU. CONCRETE-STEEL CONSTRUCTION.

possible to find a method of purification of the wastes from the factory, while those taking the other ground would close the factory, if necessary, until a satisfactory method of treatment had been developed.

There are elements of justice in each position, but neither should be applied indiscriminately. Mr. Leighton said that perhaps nine out of ten factories could purify their wastes at low cost or with positive profit. He would permit them all to run until the possibility of the purification was disproved, or was proved and the purification plant put in. This would doubtless be satisfactory for the nine plants mentioned and is practically the case for them in states providing remedial measures of any sort. His opponents look at the plant whose effluent cannot be satisfactorily purified and recognize the difficulty of stopping any pollution which has once received official sanction, even under a permit for a limited time. They would therefore prohibit all pollution and require the establishment of a system of purification before the factory could begin or resume operation.

A peculiar law was passed by the last Indiana legislature giving the state board of health power to issue permits for the discharge of factory wastes into streams, but giving it no powers over polluting wastes already entering them. The act did not carry any appropriation for paying the expenses of investigations and from the sanitarian's point of view is very unsatisfactory. A law which would put the investigation of the polluting wastes in the hands of the state board of health and would give sufficient appropriation to aid the factories in their search for methods of purification would be much more progressive and would ultimately lead to one authorizing proper proceedings to reduce the pollution in case of such factories as had failed to do their share of their own accord. Added to the present law this might serve in the manner proposed by Mr. Leighton and at the same time permit the closing of an industry whose wastes could not be purified at reasonable cost. The present law may easily be made strong enough to prevent new discharges of polluting wastes. It is certainly safer from all points of view, including the mercenary one emphasized in the paper, to be too strict in the control of polluting wastes rather than too lax. To produce the best results some latitude of choice must be left to the sanitary authority and it must be above suspicion. Appeals to the courts should always be possible, but, pending their decisions, the safe course would again be that restricting the polluting discharge, unless unfairness is plainly evident in the proceedings.

ENGINEERING ETIQUETTE.

The Council of the English Institution of Electrical Engineers has drawn up a code of etiquette which it recommends to the members of the association. Perhaps the term "code of etiquette" is a good one. It does not seem to be so binding as the usual form in which this question presents itself, and still it presents in authoritative form what is considered to be the best practice as observed by the leaders in the profession—whenever they find it possible.

The code, as quoted by Electricity, is a good one and is quite as applicable to other classes of engineers as to those practicing in the electrical field. Some of the requirements are as follows:

No consulting engineer should solicit employment as consulting engineer verbally, by letter, by agent paid by commission or otherwise, or by any other means.

No consulting engineer should answer advertisements for consulting engineers.

No consulting engineer should advertise for employment.

No consulting engineer should pay by commission or otherwise any one who introduces clients.

No consulting engineer should receive trade or other discount, or surreptitious commissions or allowances in connection with any works which he superintends.

A consulting engineer who is also directly or indirectly interested in any contracting or manufacturing business should inform his client in writing what his connection is with such contractor.

It is unfortunate that the ignorance of the people generally with regard to the engineering profession is such that these rules cannot be followed strictly. There is a fortunate few whose regular engagements or private fortunes are sufficient to permit a strict adherence to the code, but some flagrant offenders are in this class and most engineers find it necessary to get out after the work they need and often to violate the first provisions given. Not until the public is better educated will conditions improve materially. No great progress can be made until the profession takes some definite stand and presents such standards as those quoted. There has been much objection by many engineers to fixed codes of procedure and the question is often complicated with that of fees. Call it a code of etiquette and it does not seem to be quite as binding, but at the same time it can serve as an educative document, when properly presented, even if the individual engineer is forced to violate some of its provisions at times. Any society can give its sanction to such

POLICE STATION, CHELSEA, MASS., SHOWING METHOD OF CONSTRUCTION OF CONCRETE WALL.

rules of etiquette and the successive action of many societies will give it cumulative effect. Why not try it?

RATES FOR MUNICIPAL SERVICE.

A bill before a state legislature this winter and the reason for introducing it present a lesson to which the attention of cities should be drawn. It seems that a small city constructed an electric light plant some years ago which was quite successful for some time. Rates for service were considered to be somewhat high and they were lowered from time to time. It is suggested that the desire for political favors from some large consumers led to the fixing of rates for such consumers at specially low figures. To make a good showing for prompt collections 20 per cent. discount for prompt payment was made even from these low rates. The result of all these bids for popular favor has been that, while the works have been operated in such a way as to pay expenses, there has been no proper provision for depreciation and a new business administration finds a plant which requires thorough reconstruction, and has some errors in design, but finds no money with which to do the work, no credit on which to raise money, the city's debt limit being reached, and no possibility of running the plant long enough at the higher rates, admitted to be necessary, to replace the old machinery from the profits of the business.

In despair at the situation the city officials have caused the introduction of a bill to permit the sale of the plant to the highest bidder to whom a franchise for operating it can be granted. Unless some public-spirited citizen steps in and carries the plant for a time until it can be put on its feet the city will be put in the column of failures of municipal ownership.

Similar failures have occurred under private ownership. Bad management or wrecking schemes for stock jobbing purposes have often thrown private companies into bankruptcy, to be reorganized and reconstructed with new capital. This is perhaps the only instance under municipal ownership in which all the contingencies mentioned have occurred at the same time and have driven the management to such a step.

It is easy now to see where the mistakes were made, but many cities are making one or more of them, though perhaps none of them are making them all.

The reduction of rates is one of the greatest temptations under municipal management. While it may be true that some advantages of municipal ownership make lower rates possible, it is very easy to forget or to underestimate the allowance which should be made for depreciation so that rates are placed so low that calls must be made on the general fund or for a bond issue to replace worn out machinery or to make extensions. Where the city has a debt limit which has already been reached, this process is likely to be fatal, as in the present case. What should be the proper allowance for depreciation and for extensions is a question worthy the closest attention of financiers familiar with local conditions, and their advice should be followed implicitly.

If rates are not placed too low, an apparently large profit on years when there are no special expenditures tempts the council or the superintendent to lower rates, to remit the payments for city light or to turn the excess into the other funds of the city. The result is the same in the end, except that in the latter cases the general taxpayers have reaped the benefit in reduction of taxes, to which they are not entitled, while in the first the users of light have received the benefit in low rates. The dilemma for the plant is the same in the end.

If the city can borrow the money for extensions and improvements and pay the interest, it may, under some circumstances, be equitable to pay the excess of receipts over expenditures into the city funds. In the case under consideration this would have been as fatal as the course pursued.

If other cities will take warning from this disaster it will not have occurred in vain. Too many cities are running close to the limit in the financial management of their plants, more of them that the council may have a reputation for reducing the tax rate than that the superintendent may make a reputation for economy, but the final result is likely to be the same in either case.

THE QUESTION DEPARTMENT

THE PROSPECTS FOR THE CEMENT INDUSTRY.

We have been referred to you by Mr. William J. Donaldson and Mr. B. B. Lathbury of Philadelphia, who have told us that it is your custom to make careful advance estimates of the probable amount of cement that can be marketed in the United States during the coming year. In case you have worked out the estimate for which we ask we would be glad to have your views about the amount of Portland cement, approximately, that you think can be marketed in the different sections of the country; for instance, the requirements in the New England, the Middle Atlantic, Western States, etc.

We have been told that Herr Schoff, President of the Society of German Cement Manufacturers, has made the statement that there will be a demand in this country in 1903 for 30,000,000 barrels of Portland cement. Do you regard this statement as reliable? If, viewing the cement industry from your standpoint, you believe the increased demand estimated by practical technicians will reach this large amount, and can suggest the cause, due to special work, etc., for such an expansion in the demand, we will be much obliged to you. We would also like to know if you can note any marked increase in the proportion of concrete used in comparison with the amount of concrete used in structural work in previous years.

J. & W. SELIGMAN & CO.,
Per RUFUS WAPLES,
Philadelphia, Pa.

The leading article in this number of Municipal Engineering gives the estimate of the probable amount of cement that can be marketed during 1903 if business conditions continue to be favorable. It is possible to divide this estimate among the various groups of states only in the most general way and the statement of special work below may serve as an indication of the causes for increased use in some of the districts. It considers only the largest projects requiring cement.

Herr Schoff's statement is, in our judgment, approximately correct, if all kinds of cement are included. As stated in the article on page 83, the amount of Portland cement used will approximate 20,000,000 barrels. Should the United States use Portland cement as freely as Germany did in 1900, Herr Schoff's statement would be very nearly correct for that class of cement, but that figure has not yet been reached, though we are rapidly approaching it.

1900, Herr Schoff's statement would be very nearly correct, but that figure has not yet been reached, though we are rapidly approaching it.

The general fields in which cement is used are increasing in number and area, as described in the article referred to. The questions of cost and of knowledge of the material determine the rapidity of growth in any locality. In districts well supplied with cement mills the growth is more rapid than where freight rates put the competition of cement concrete with other materials on a closer basis. A few large enterprises which will use large quantities of cement may be mentioned as reasons for specially large sales of cement in their districts. Such operations usually promote the use of cement in other classes of construction in the same neighborhood. Many thousand barrels of both Portland and natural hydraulic cements are being used in the rapid transit subways of New York and the new Brooklyn bridges, and much more will be used in the Pennsylvania railroad tunnels. The new subway tunnels in Philadelphia will use a large amount of cement. The power developments at Niagara Falls will make a call upon the cement market. The Cincinnati water works system is at present a large user. The Big Four railroad is reported to have let to one man a contract for 60,000 cubic yards of concrete to be laid during this year and next, and this covers only part of the system. The New Orleans sewerage and drainage construction has been and will be a large customer. This list might be continued down into smaller work indefinitely.

However, the general uses for cement are increasing so rapidly that this special work, while a very important factor in the cement market, is not so important as formerly. Concrete is rapidly displacing other materials for foundations, walls, piers, abutments, bridges, breakwaters, sea walls and piers, and all classes of work heretofore requiring stone or brick masonry, and its use by railroads, the national government, cities and private corporations is increasing rapidly enough to account for nearly all the expansion in the cement trade which is predicted. But few railroads have as yet adopted concrete without qualification, but its successful use in large quantities and in many classes of work by such great railroad systems as the Illinois Central, the Chicago, Milwaukee &

St. Paul, the Northern Pacific and others will soon convince the more conservative of its value and great adaptability to railroad conditions, as well as of its economy. Other uses of cement and their expansion are considered somewhat in detail in the article referred to.

HOW TO MAKE THE STRONGEST CONCRETE.

Mr. George L. Stanley, a contractor of Portland cement work, of Ashtabula, O., has been iterested in the discussions of the methods of making the strongest concrete and sends the following clear description of the method of mixing and applying water used by him, as a contribution thereto, which is of much value.

"From my own experience I think the manner in which the water is applied, and the careful and thorough mixing dry and when the water is applied have much to do in getting the best results. From what I have learned from experimental tests as well as my own fourteen years' experience, water should be applied slowly with a sprinkler and the concrete cut through from top to bottom as it is sprinkled, so as to wash the cement off the surface as little as possible, using just enough water so that it will not run away from the concrete as it stands in the mixing box. The sooner it is put in the moulds after it is wet the easier it can be compacted and finished, and consequently the strongest work is the result."

BOOKS ON BRIDGES OF STEEL AND CONCRETE.

I am in need of a good work on construction of iron bridges from forty to eighty feet span and would like to have information on concrete work of the same span. What can you recommend?

A. G. P., Pittsburg, Kan.

Johnson, Bryan & Turneaure's "Theory and Practice of Modern Framed Structures" ($10) is an excellent book whose title fits it. Other books on highway bridges are listed in Municipal Engineering, vol. xx, p. 88. Regarding concrete work the "Directory of American Cement Industries and Handbook for Cement Users" ($5) is the fullest upon practical construction. Cain's "Theory of Steel Concrete Arches" (50 cents) and Howe's "Treatise on Arches" ($4) treat the subject from the theoretical standpoint. Municipal Engineering contains much practical instruction upon the use of concrete in bridges from month to month. A list of articles is given in vol. xix, p. 179. Some others will be found as follows: "Highway Bridges of Concrete," vol. xix, p. 388; "Melan Arches in Indianapolis, vol. xx, p. 63; "Westvale Concrete Bridge, vol. xxii, p. 137; "Concrete-Steel Bridges, vol. xxiii, p. 155.

LAYING TILE FLOORS.

Please give me the fullest information obtainable about putting down tile floors, mosaic veneered tile.

W. B. T., Charleroi, Pa.

Will our readers be willing to share their knowledge and experience with our correspondent? The general process is to bed the tiles in a layer of rich cement mortar, thick enough to insure good connection with the floor construction below, taking pains to lay this bed only as fast as the tiles can be laid in it. The floor structure sustaining the tiles must be solid enough so that there will be no deflection sufficient to break the bond of the tile layer or its bed. There are many details of proportions of mortar, preparation of bed, leveling of floor surface, etc., on which the highest class of work depends, which can be stated best by those who are expert in the work of laying, and if any of our readers will send us the results of their experience they will be combined in an article for the benefit of all tile layers.

BEST METHOD OF HOUSE NUMBERING.

Please inform as to the best method of house numbering where the streets are irregularly laid out.

W. R. TOY, City Engineer, Lima, O.

The best plan for house numbering usually applicable is one in which the numbering begins at a center and runs 100 numbers in a block (the distance between two streets). This center is usually on the main street, sometimes at one end, where the end is a body of water or the boundary of another corporation, but more often at a central point on or near this main street. Streets which are parallel or at right angles to the main street are easily numbered on a rectangular plan, starting from such a center. Diagonal streets will be numbered according to the direction to which they approximate nearest, those at angles of 45 degrees belonging to the system to which they may be assigned, all going to the same system.

If the streets are approximately parallel, the irregularity being in their lengths and in the lengths of blocks between them, a similar plan can be followed, but the beginning of new hundreds in the numbering will often not coincide with the beginning of blocks. To determine the best method take a plat of the city and locate on it lines parallel to the general direction of the streets, usually straight lines, though angles are not strictly prohibited. Place these lines at approximately equal distances apart so that they will coincide with or run close to as much street length as possible, and divide the streets running in the opposite direction into approximately equal

lengths. Use these lines, imaginary on the ground, as guides for the beginning of new hundreds on the ground. The numbering can very often run through to the next street, a short block in one place making up for a long block elsewhere, but occasionally it will be necessary to begin the new hundred at an alley or on the line between two lots. The number of a house will give its approximate distance from the central street with almost as much accuracy as in a city regularly laid out, and the numbers on approximately parallel streets will agree within less than 100, a great convenience for persons hunting numbers on streets running in the same general direction as the street car line on which they are riding.

When districts are met with in which the streets are irregular in direction as well as distance, judgment must be exercised in fitting the numbering of streets to the rectungular imaginary lines laid down on the map. Streets with many and great changes in direction will be difficult to manage, but if the general plan is followed some solution of the numbering problem can usually be found. Streets running in semi-circles or even full circles will sometimes be found in plats of suburban towns added to the city, and separation into streets of two or more names may sometimes be the easiest solution. There is an occasional meeting of several such streets in such a plat where it is difficult for the citizen to determine on which street the house he is hunting is located, but the plat should govern and the difficulty in finding the house must be attributed to the complexity of the plat, not to the system of numbering.

Streets not ending on the central street should receive numbers corresponding to their position on the plat. It is much more convenient for one unfamiliar with a street or with its position to locate it and a house on it, than if its number begin with zero at the end of the street.

Frequently houses with numbers in different hundreds will be found on opposite sides of the street, but the exercise of judgment in locating the place of changing the hundred will reduce inconvenience on this account to a minimum.

A very irregular city can be numbered as a whole on the plan proposed above for irregular districts. Draw lines parallel to the central streets or to the lines assumed as zero lines, placing these lines 500 feet apart. Exercise judgment in beginning new hundreds as near as possible to the intersections of these lines with the streets, beginning them at street or alley intersections whenever possible. The number of the house will then indicate the distance from the central street in terms of the imaginary 500 foot blocks. Close study must be made of each street to determine whether it belongs most properly to the east and west or to the north and south system. Division of very irregular streets into separate divisions with different names may also be desirable in some cases. If the stranger can keep the two systems distinct in his travels about the city the numbering as though the streets all started from the central lines will be a great assistance, even more than the same system in a rectangular plan.

HOW TO REPAIR VILLAGE STREETS.

What is the best way to fix our roads? They are very bad, indeed, and the way they have been doing is scraping the mud off and spreading gravel afterward, which is not satisfactory as the gravel works down and the mud up again in a short time. We have no tools to fix roads with except scrapers, and we have thirty to forty miles to fix. They will all be torn up this year as we are going to put a sewerage and drainage system in.

ERWIN M. REBER,
Wheaton, Ill.

Certainly nothing permanent can be done until the sewers are in and the trenches have had some time to settle. The best advice as to methods of street construction and repair ought to be obtainable of the engineer designing or superintending the construction of the sewer system, for he is or can most easily become acquainted with the conditions and with the materials available. A few suggestions may be made of the minimum amount of work necessary. Presumably the streets are laid out on the Illinois prairie soil, and are bottomless at certain seasons of the year. The first necessity, that of drainage, should be met by the sewerage and drainage system soon to be constructed. The question suggests that the drainage is now far from good. It must first be taken care of. The cross sections of the roads may possibly be formed with scrapers to make drainage to gutters and sub-surface drains easy and to lower the road surface enough to allow a coating of road material for a wearing surface thick enough to keep the earth underneath dry and hard enough so that the wheels of wagons will not break through it.

Most roadways in small towns are too wide. They can very profitably be narrowed to thirty feet or less, grading up the space on each side to form a grassy lawn between the gutter or curb and the sidewalk. Whatever the width of the roadway, it should be covered with a thick and uniform coat of road material, and if there is danger of washing out, the gutters should be paved with cobble stones, paving stones or otherwise in form and size sufficient to carry off the

water. The thickness of the road material used for a wearing surface will depend upon the character of the material and the amount of traffic. Excellent roads have been made of four inches of broken stone laid of uniform thickness on a properly formed and compacted bed and thoroughly rolled. A fine and dirty gravel does not make a good road, but if laid 12 inches or more in thickness, well rolled and kept constantly in repair, a passable result can be obtained in the absence of better material or money to pay for it. These are the minimum thicknesses in either case; more is necessary on streets which are as well traveled as main country roads, and more is desirable that the cost of maintenance may be reduced. Satisfactory streets cannot be made on ordinary Illinois prairie soil with any less work and material than that indicated. A roller is suggested, and it is worth many times its cost in compacting the sub-grade and the road covering. A town large enough and progressive enough to put in a sewer system will doubtless have energy enough to improve upon the methods of construction here proposed as soon as the completion of the drainage system permits the work to begin.

MUNICIPAL EXPENDITURES FOR STREET AND SIDEWALK PAVING.

Can you give me the approximate percentage paid by United States cities for permanent roadways, such as asphalt and brick and for cement sidewalks?

ANGUS SMITH.
Stratford, Ont.

The statement of the question is not definite. The Bulletin of the Department of Labor for September of each year gives the statistics of cities for the previous year, with some approach to accuracy. It has been assumed that the percentages asked for were to be computed on total expenditures for municipal public works or upon total expenditures for municipal operation and the table below has been computed from the data for 1901 as the nearest answer to the question thus interpreted which can be given at this time.

The report referred to gives in detail in one table the expenditures for construction and other capital outlay for cities from New York with population of 3,437,202 in 1900, to Joliet, Ill., with population of 29,353, the 137 largest cities of the country. In another table is a summary of receipts and expenditures, giving, among other things, the totals for construction expenditures, and all expenditures, excluding loans repaid.

From these tables the percentage of expenditure for street improvements in terms of the total construction expenditures or the total municipal expenditures could be computed for each city. The percentage for individual cities would not always be accurate, because the cities do not have uniform methods of keeping accounts and omissions and additions are made of which the following taken from notes to the table are examples: Certain cities do not include in the expenditures for streets those from trust funds, those expended by property-owners by special assessment, while others do, and two or three include payments for sewers in the same account with those for streets. Similarly, the totals in a number of cities include payments of state and county taxes, in one city part of the payment for waterworks construction, in another payments by the county, and in a few instances do not include items which should be included, such as lighting, schools, street cleaning and sprinkling, sewers included in maintenance rather than construction, etc. It seems impossible to reduce all to the same basis, so that the percentages from individual cities cannot be compared with any great degree of accuracy. The effects of these discrepancies are reduced in averages and for this reason averages only are given in the table.

For convenience in making up the tables in the bulletin the list of cities was divided so that 37 cities, above 100,000 population, are in one division; 33, above 54,000, in the second; 47, above 34,000, in the third, and the 20 remaining and above 29,000 in the fourth. This division is maintained in the following table:

PERCENTAGE EXPENDITURES FOR STREETS AND SIDEWALKS IN AMERICAN CITIES IN 1901.

No. of Cities in Average.	Range of Population.	Street Expenditure, Percentage of Total Expenditures.	
		For Construction.	For all Municipal Purposes.
37	100,000 to 3,437,202	17	5½
33	54,000 to 100,000	21	6
47	34,000 to 54,000	23	7
20	29,000 to 34,000	26	9
137	29,000 to 3,437,202	18	5¾

The increase in per centage with the decrease in population is quite marked, being greater in the last column than in that preceding. In other words, new construction of streets and sidewalks in the year 1901 cost more in proportion to all expenditures for construction in the smaller cities than in the larger ones, and the cost of maintenance and operation of the city offices and works cost

less in proportion to total expenditures in the smaller cities than in the larger.

Too much reliance must not be placed on these figures for the reasons stated. Probably other groupings would modify the per centages somewhat.

THE INDIANAPOLIS PAVING EXPOSITION.

Please let me know in what year the exhibition of paving materials was held in the city of Indianapolis. A pamphlet was issued at the time giving opinions as to classification of the various pavements as to their merits.

ERNEST ADAM,
Engineer Street and Sewer Department, Newark, N. J.

The Indianapolis Street Paving Exposition was held under the direction of the Commercial Club of Indianapolis on April 1 to 5, 1890, and had much influence upon public opinion in that city concerning methods of street paving. A pamphlet was issued describing the various exhibits of pavements and paving materials and containing the reports from various delegations from other cities, who came to investigate, giving their opinions of the different pavements exhibited. A few copies of the booklet are still in existence.

HORSE POWER OF CENTRIFUGAL PUMPS.

Can you furnish or refer me to a reliable formula for calculating the horse power of centrifugal pumps, discharge, lift and length of pipe being given? Several authorities at hand appear to conflict. SUBSCRIBER, Toledo, O.

The formula for the work done by a centrifugal pump in raising water depends not only upon the number of gallons of water raised to a given hight in one minute but upon the design of the pump. The theoretical formula is developed in Bovey's "Hydraulics" ($5). Blaine's "Hydraulic Machinery" ($5) also has a theoretical discussion of the subject. To the work done as computed from these formulas must be added the work of turning the pump and overcoming the friction of the water in the pipe if it is a long one.

The efficiency of a pump is the ratio of the work of lifting a column of water of the diameter of the pipe to the hight of the lift to the total work done by the pump in the operation. The latter is computed by the formula and the former from the weight of the water and the total lift. Bovey gives a table showing the efficiencies of pumps of various designs of vanes, speeds, etc., showing a variation in the theoretical efficiency from 53 per cent. to 92 per cent. The extreme in this table is never reached in practice on account of practical difficulties in construction. In papers before the American Society of Mechanical Engineers Webber gives a diagram of the results of his computations and experiments, showing that the efficiency of centrifugal pumps varies with the hight of lift, increasing from 45 per cent. for very low lifts to 70 per cent for about 18 feet lift and then decreasing for higher lifts, reaching 40 per cent, for a lift of 60 feet, beyond which the diagram does not go.

The manufacturers of centrifugal pumps give tables in their catalogues showing the discharge, horsepower per foot of lift required to drive the pump, sizes of pipes and pulleys and revolutions per minute for various hights of discharge. The hights of discharge for which the average horse-powers per foot of lift are given are not stated, but are based upon experiments, probably upon ordinary lifts. If the efficiencies of the various sizes of pumps are computed by comparing the horse-powers for one foot lift, stated in the table, with the horsepower computed from the weights of the water discharged, with one foot lift, taken from the table, the pumps of one maker have an efficiency of 50 per cent., those of another vary from 52 per cent. for the smallest size to 61 per cent. for the largest, and of another from 50 to 58 per cent. These doubtless include the power required to drive the pumps and the friction in short discharge pipes. Further reduction must be made for long discharge pipes according to the size of pipe and velocity of water, by formulae or tables giving the friction loss of flowing water. According to Webber, there must also be reductions on lifts over eighteen feet, increasing as the lift increases.

A theoretical formula can be derived for any given pump, its design and relative dimensions being known. The manufacturers' tables should be based on experiment as well as theory, and thus give results exactly fitted to the pump tested. Unfortunately the lifts and speeds for which the horse-powers given in the tables were derived are not given, so that there is indefiniteness on this point. The assumption that the horse-powers given apply to all the lifts given in the same line of the table is incorrect, according to Mr. Webber.

COST OF KREODONE BLOCK PAVEMENTS.

Can you give me information regarding the cost per square yard laid in the street of the Kreodone creosoted wood block pavement described in the January number of Municipal Engineering?

W. R. TOY, City Engineer,
Lima, O.

The cost of a pavement in any locality depends upon many items, so that figures for any given place must be considered as only roughly approximate in another city. Some estimates of the cost of 4-inch creosoted yellow pine blocks on one inch

of sand and six inches of natural hydraulic cement concrete give the cost as $2.25 to $2.35 a square yard. If there is much excavation, if the freight on blocks is high, or cement and stone are expensive, these figures may be increased somewhat. A contract for a viaduct pavement of creosoted pine was let in Milwaukee in August at $2.43 a square yard. The conditions are somewhat different as to foundation from those in a street. It is not easy to compute the cost of pavements laid in Indianapolis on account of the form of bid, but approximately it may be said that the Kreodone creosoted yellow pine block pavements laid in that city cost from $2.60 to $2.75 under present prices, with Portland cement concrete. Some pavements have been laid at somewhat lower prices when materials and labor cost less.

SEWER TRENCH MACHINES.

I would like to know the best machines or plants for excavating sewers for pipes 6 to 24 inches in diameter and 6 to 16 feet in depth.

JOHN M'COY,
New Orleans, La.

The more elaborate trench machines are not generally used for trenches of this size unless in connection with larger work. The writer has had some experience with the following machines on larger work and finds each to have its advantages and each to be best applicable to certain conditions: The Potter, made by the Potter Mfg. Company, Indianapolis; the Carson, made by the Carson Trench Machine Company of Boston; the Lidgerwood, a simple cable and trolley run by hand, horse or gasoline engine, and a simple cable hoist run by horse or small engine. In trenches for pipe sewers more than one lift deep some contractors obtain very satisfactory results from the simple hoist, dumping on the side of the trench or into a wagon. In alleys or other narrow ways the trolley answers well for short transfers to dump the earth from the trench ahead into the trench over pipe laid behind. The Potter and Carson machines are economical and adapted to any width or depth of trench. They differ considerably in detail and in methods of handling, can either of them be used on most work, but under peculiar conditions a choice must be made according to the circumstances, one perhaps fitting them better than the other.

There are several other good machines. If our readers are disposed to give information regarding their experience with these or other machines, especially regarding cost of handling various classes of materials it will be very acceptable to engineers and contractors.

BOOKS ON GAS MANUFACTURE AND SUPPLY.

Will you kindly advise me on a good gas engineers' handbook which is likely to prove most satisfactory in the matter of practical information on the subject of gasoline gas illumination from central plants? If none of them pay much attention to this special field I would like the name of the best and most practical "all around" gas engineer' handbook.

ARNOLD C. KOENIG, Omaha, Neb.

There is no book considering the use of gasoline for making gas for central gas lighting plants, except in the use of hydro-carbons for enriching gas lacking in needed qualities. Any of the books treating of modern methods of gas making contains chapters on this subject. American books are not numerous. Butterfield's "Chemistry of Gas Manufacture" ($3.50) treats of the production, purification and testing of illuminating gas. O'Connor's "Gas Engineers' Pocket Book" ($3.50) contains tables, notes and memoranda concerning the manufacture, distribution and use of coal gas and the construction of works. The author is an Englishman and the book is a full collection of facts in all branches of gas manufacture. Burns's "Illuminating and Heating Gas" ($1) is an English book treating of the manufacture of gas from tar, oil and other liquid hydro-carbons. Newbigging's "Handbook for Gas Engineers and Managers" ($6) is a book whose sixth edition was issued a few years ago. A new edition may be published this year.

The makers of fuel gas generators, the Acme Gas Company of Chicago, for example, can give much information on the subject.

SECOND HAND SURVEYING INSTRUMENTS.

Will you please give me the addresses of several firms handling second-hand engineering instruments? I wish to purchase a reliable second-hand level in good condition.

A. W. F. Celina, O.

Reference to the "Business Directory" under the heading "Surveying Instruments" will give the names of reliable dealers in instruments who frequently have second-hand instruments for sale. They are L. Beckman, Toledo, O.; Eugene Dietzgen, Chicago, Ill.; J. C. Ulmer & Co., Cleveland, O.. Other manufacturers and dealers are F. E. Brandis Sons & Co., Brooklyn, N. Y.; W. and L. E. Gurley, Troy, N. Y.; R. Seelig, Chicago; Keuffel & Esser company, New York and Chicago; the T. F. Randolph company, Cincinnati, O.; C. L. Berger & Sons, Boston, Mass. Not all of these deal in second-hand instruments, but one can occasionally secure such an instrument from nearly every one of them.

LEGISLATION REGULATING THE PRACTICE OF ENGINEERING.

Our engineers are again considering the question of regulation of engineering by state legislation. Would you be kind enough to refer us to any data or laws governing the same and any discussions, pro or con, that will be of service to us?

GEO. W. CRAIG,
Omaha, Neb.

The sixteenth annual report of the Illinois Society of Engineers and Surveyors (50 cents) contains the proposed law for the regulation of surveying in the state of Illinois. In the "President's Address," contained in the same volume, will be found a paragraph drawing a distinction between surveying and engineering and showing the difference in the character of legislation in the two branches of the profession. This distinction is seldom definitely drawn, but may well be considered. The proposed law was based on the Illinois act providing for the licensing of architects, passed in 1897, and now in successful operation. A copy of the architects' law can probably be obtained of the secretary of the board of examiners, Peter B. Wight of Chicago, 1112 Chamber of Commerce. Some reasons for the failure to pass of the proposed act relating to the practice of surveying will be found in papers and discussions in the seventeenth annual report of the Illinois society.

California and New Jorsey also have acts regulating the practice of architecture.

There are three ideas in mind in considering the practice of engineering, which are not separated with sufficient distinctness in the agitation of the subject of the regulation of practice, and much confusion results as a consequence. The first is the question of qualifications, which are easily determined in the surveyor and in the less important matters of information and experience of the engineer. The quality and accuracy of his judgment are not to be determined by any examining board, and cannot be subjected to regulation by law. The second consideration is that of etiquette, as it is termed in an editorial elsewhere in this number of Municipal Engineering. This also is not subject to legislation, except when the violation of its provisions is so flagrant that it comes under the action of the criminal code. The third is the matter of compensation, again a subject not well adapted to legislative action.

The former proposed law for the regulation of the practice of engineering in Nebraska, was discussed editorially in vol. xii, p 177 of this magazine. Other phases of the subject are considered on pages 36 and 102 of the same volume, the latter with reference to a proposed Minnesota law; in vol. xiv, p. 352, describing the certificate of qualifications issued by the British Association of Municipal and County Engineers, and the method of obtaining it; in vol. xv, p. 39, discussing the law for Illinois architects and suggesting the revision of plans for public works by a state board as a better method of "regulating the practice of engineering" than a law prescribing qualifications and methods of determining them; in vol. xvii, p. 345, regarding the selection of a city engineer for Alexandria, Va., from those who passed an examination intended to determine qualifications for that class of work; and in vol. xx, p. 151, in which the examination for membership in the British Institution of Civil Engineers is also mentioned. Mr. C. B. Allen gives the reasons for a law for Iowa in vol. xiv, p. 151. The Canadian society of Civil Engineers agitated the question of a law regulating the practice of civil engineering some years ago. It is possible that a copy of it can be obtained from the secretary of the society.

There are apparently no laws in the United States regulating the practice of engineering. The states of Massachusetts, New York and Ohio have adopted a partial policy of regulation in the indirect manner noted above, requiring the submission of plans for certain public works, notably for sewers and water supplies, to state boards for approval before the works can be constructed. Indiana proposed a similar law some years ago, with provisions for determining the qualifications of the board and its employes. The Secretary of the State Board of Health at Indianapolis can furnish details.

No attempt has been made to establish a code of ethics by legislation except so far as the subject of etiquette has been confused with that of the determination of qualifications. A recent discussion of this subject will be found in the Transactions of the American Society of Civil Engineers, vol xlix.

Several states provide schedules of fees for surveyors and a law was proposed regulating the qualifications and fees of bridge engineers on public work in Indiana, but was not approved by the Indiana Engineering Society. Legislation on this subject is usually objectionable for the fees are so low that good men are driven from that class of work as soon as they have progressed sufficiently to do it well, unless other circumstances keep them at it as a partial occupation or they can secure additional compensation by private contract or liberal interpretation of the law.

Michigan has a law regulating the making and filing of plats for additions to cities and towns which, in a sense, is a regulation of the practice of surveying.

MUNICIPAL MATTERS IN COURT

Lighting Rates—Interurban and Street Railways—Home Rule—Municipal Ownership—New Orleans Drainage Board—Park Act.

Abstracts from Decisions of the Higher Courts.

Prepared by George H. Murdoch, Jr.

Abutting Owners—A municipal corporation is not liable for damages sustained by an abutting owner by reason of the escape of the natural flow of surface water from a highway onto the land because of the filling in of the highway. O'Donnell vs. White, City Treasurer, 53 At. Rep. (R. I.) 633.

Bond of Contractor—Scope—A contract required the contractor to furnish all materials, labor, etc., and give a bond for faithful performance, and to pay for all materials used and wages of laborers employed. The bond given bound the surety that the contractor should in all things comply with the contract. Held, that laborers and materialmen employed by the contractor were beneficiaries of the bond, and proper parties to a suit to enforce it, nor did it indemnify the town from all suits against it for or on account of any injuries or damages sustained by any person, structure, or property, by or from the contractor, or in consequence of any act or omission of himself or his servants or agents, and did not cover a liability of the town for counsel fees incurred in defending a garnishment proceeding brought against it by a creditor of the contractor. Town of Gastonia et al. vs. McEntee-Peterson Engineering Co. et al., 42 S. E. Rep. (N. C.) 858.

Contractor's Bond—A city ordinance provided that city contractors should give bond to pay wages of laborers and for material furnished, and the city took from a contractor a bond conditioned for the faithful performance of his work and the payments required in the ordinance. There was no stipulation in the bond that it should be for the use of laborers or materialmen. After the work was completed, the contractor recovered a judgment against the city, in which no question as to laborers or materialmen was raised. Held, That no action was thereafter maintainable in the name of the city to the use of the laborers and materialmen on the bond given by the contractor. City of Lancaster, to Use of Penn Iron Co., Limited, vs. Frescoln et al., 53 At. Rep. (Pa.) 508.

Defective Sidewalk—Testing with Magnifying Glass—A city being required only to use reasonable care to keep its sidewalk in a reasonably safe condition, the jury should not, in an action for injury to a pedestrian from the breaking of the sidewalk, the rotten condition of which is in issue, be permitted to examine the wood therefrom with a magnifying glass. City of Elgin vs. Nofs, 65 N. E. Rep. (Ill.) 679.

Public Contract—Extra Work—The provision in a contract with a board of commissioners that the contractor should make no claim for extra work, unless contracted for in writing, related to work concededly not within the contract, and not to change in plans and specifications. Dwyer vs. Mayor, etc., of City of New York, 79 N. Y. Supp. 17.

Public Contract—A taxpayer under a special assessment for the construction of a sewer cannot defeat the collection of the tax by showing that the contract for the improvement contained clauses for the forfeiture of the contract, pursuant to Rev. Code Chicago 1897 sec. 1,687, if more than eight hours' work per day was compelled or allowed, and prohibiting the employment of alien labor, without also showing that the clauses affected the bidding or limited competition, though it is not necessary to show that they actually increased the cost of the improvement. McChesney vs. People ex rel. Raymond, county collector, 65 N. E. Rep. (Ill.) 626.

Release of Contractor—Where a city released an accepted bidder, who had given a bond with solvent surety, to perform certain street improvements, on the bidder's application, after he had become insolvent, and the bid accepted on a second advertisement, though the lowest then made was higher than that of the released contractor, property owners subject to assessment for the improvement were entitled to recover over against the city the difference between the cost of the improvement under the bid of the released contractor and the cost under the subsequent bid. The statute of limitations did not run, as against the prop-

erty owner's right to recover such difference in an action for money paid, until he had actually paid his assessment for the improvement. City of Louisville vs. Kentucky & I. Bridge Co., S. W. Rep. (Ky.) 627.

Sewers—Liability for Overflow—Where a municipality has constructed and maintained a sewer adequate for all ordinary purposes, it is not liable for injuries to abutting owners caused by an overflow of the sewer due to a storm of extraordinary violence. Sundheimer vs. City of New York, 79 N. Y. Supp. 278.

Subcontracting—Consent—A building contract provided that the contractor should not subcontract any part of the work without the consent of the architect. At the time the contract was let the contractor informed the board in charge of the work that a certain person as subcontractor would do the carpenter work. The subcontractor was present at the time, and neither the board nor the architect made any objection to the subcontract. The subcontractor performed work on the building for over a year, and to the value of several thousand dollars, and no objection was made until he sued to enforce his lien. Held, that the consent of the architect was in effect given as required. Ocorr & Rugg Co., vs. City of Little Falls et al., 79 N. Y. Supp. 251.

Telephone Companies—Rights Under Franchise—An ordinance granting a privilege to a corporation being accepted and acted on becomes a contract, the validity of which cannot be questioned by one not a party thereto. A grant of right to a telephone company to establish a telephone system in the streets subject to the power to grant a like right to another company, so as not to interfere with the right granted to the first company, protects it only against unnecessary and unreasonable interference. The placing of wires of a telephone company in the streets as directed by the city will not be enjoined at suit of a prior occupying telephone company unless the power of the city is abused to the oppression of complainant. The danger to a telephone company from the breaking of wires of another such company is so remote that placing of the wires of the later occupying company above those of the prior occupying company will not be enjoined. Chicago Tel. Co. vs. Northwestern Tel. Co., 65 N. E. Rep. (Ill.) 329.

Trespass by Municipal Servants—A municipal corporation is not liable for a trespass on land committed by its servants, though done under color of authority, unless the acts were expressly authorized, or ratified, or done in good faith pursuant to some general authority. O'Donnell vs. White, city treasurer, 53 At. Rep. (R. I.) 632.

Evanston Wants Lower Rates for Light.

A decision was rendered by Judge Chytraus Jan. 20, in favor of the citizens in the fight for lower rates for electric lighting in Evanston, Ill. In overruling the demurrer of the Evanston Yaryan company, the receiver, and the Northern Trust company, trustee, to the petition of C. A. Wighton and others, Judge Chytraus said: "If the allegations of the petitioners are proved, the bill for foreclosure against the Yaryan company will be dismissed and the receiver discharged." The petitioners for lower rates expect to show collusion between the two lighting companies.

A Baltimore Interurban Railway Wants to Bridge Navigable Waters.

Judge Stockbridge of the Superior Court, Baltimore, Md., dismissed the petition of the Dundalk, Sparrows Point and North Point Railway Company, Jan. 5, filed to compel the board of public works to either aprove or disapprove the plans of the railway company to construct bridges over Jones Creek, North Point and Shallow Creek. The board of public works has decided that the consent of the legislature must first be obtained to construct the bridges before any action on its part could be taken. Judge Stockbridge decided that the streams being navigable, the Board of Public Works has not the power to grant authority to bridge them, as such grant would involve the giving away of public property. He, therefore, dismissed the petition. The decision will delay the company until the next meeting of the legislature, unless the Court of Appeals reverses the decision of the lower court. It must be understood that the dismissal of the petition will in no way interfere with the construction of the railway to Sparrows Point, as the bridges in question are beyond Sparrows Point.

A Milwaukee Elevated Railway Franchise Declared Void.

A decision rendered December 30 by the supreme court of Wisconsin declared void the franchise granted by the council of Milwaukee to the Milwaukee, Burlington & Lake Geneva railway company. The company was incorporated in February, 1901, to build an elevated line in Milwaukee, but a question arose involving the point that the road to be built was a commercial and not a street railway. The incorporators will, it is be-

lieved, endeavor to secure a new franchise from the city which shall avoid this objection.

Suit to Test Massachusetts Street Railway Law.

The city council of Worcester, Mass., has directed the city solicitor to go to the United States supreme court to test the constitutionality of the Massachusetts street railway law of 1898. The city began action against the Worcester Consolidated Street Railway Company in 1900 to compel the company to keep in repair the paving between and 18 inches outside the rails where it had locations. The company fought the case until it reached the supreme court of Massachusetts, which handed down a decision supporting the contention of the company that the law of 1898 is constitutional. The street railway law of 1898 provided that in return for an excise tax which the company contributes to cities and towns through which it operates, it shall be relieved of conditions as to repair of the highway and the care of snow on the street. The excise tax provided for by the law is a percentage of the gross earnings per mile, from 1 per cent. for roads earning $4,000 or less, to 3 per cent. for roads whose gross receipts per mile of track operated are $28,000 or more. The tax is fixed annually. The excise tax is in addition to other taxes. About $10,000 a year is involved in the case brought by the city of Worcester.

Home Rule Principle Violated by New York Special Tax Law.

The Appellate division of the New York Supreme court decided, Jan. 19, that the special tax law of 1899 is unconstitutional in the respect that it takes the power of assessment from local officers and imposes it upon the state board of tax commissioners, thus violating the "home rule" principle of the Constitution. The decision was rendered by a divided court, and was, in substance, but an intermediate step in the consideration of the matter as the case now passes to the court of appeals.

Ottumwa's Struggles for Municipal Ownership.

Another chapter in the fight which the city of Ottumwa, Iowa, is making for municipal ownership of the water supply was begun recently by the City Water Supply Company filing another injunction against that city, this suit including the United States Cast Iron Pipe & Foundry Company and the Des Moines Bridge & Iron Company. Where the city made an effort to gain possession of the water works the City Water Supply Company filed a petition in the federal court asking for an injunction restraining the city from carrying out its purpose on the ground that the city's indebtedness already exceeded the constitutional limit. This injunction was granted. The city next passed an ordinance creating a sinking fund and made a contract with a firm to construct a plant and receive pay out of this sinking fund. Upon application of the water company the federal court granted another injunction. The city appealed the case to the circuit court of appeals and the opinion of the lower court was affirmed. The city had, in the meantime, had another citizen bring action for an injunction in the state court. This injunction was granted but when the case was carried to the supreme court the decision of the lower court was reversed, and this court declared that the city had a right to proceed with the sinking fund plan. The city was unable, however, to go ahead because of the restraining injunction, which had been held valid by the circuit court of appeals. On Nov. 8, 1902, the council advertised for bids for furnishing and laying cast iron water pipes in the streets of the city, and the contract for furnishing the pipe was awarded to the United States Cast Iron Pipe & Foundry Company, and for laying the mains to the Des Moines Bridge & Iron Company. These pipes were to be laid without any water connection whatever and there was nothing in the contract to show what they were to be used for. A special election was held Jan. 12 to ratify these contracts. The last suit by the city water company was kept quiet until the day of the election when notice was served upon the city of Ottumwa. The petition for injunction was filed with the clerk of the federal court in Keokuk. It recites the fact that the City Water Supply Company of Ottumwa is a corporation, incorporated under the laws of Maine; that the company owns property in the city of Ottumwa valued at $500,000; that the limit of indebtedness which the city of Ottumwa can legally contract under the constitution of the state is $119,126.45, and that the city is already in debt $140,894 with a number of other contracted obligations, such as paving, sewers, etc.

Vote Necessary Preliminary to Municipal Ownership in Wisconsin.

The Wisconsin supreme court decided Jan. 13 that a city in Wisconsin cannot construct and operate a water works system of its own until the matter has been put to a popular vote. This de-

cision sustains the decision of Judge Burnell in permanently restraining the council of the city of Appleton from issuing $260,000 bonds for the construction of a water works plant. The city of Appleton decided about two years ago to acquire and operate its own water works system. Being unable to agree on a price to be paid to the Appleton Water Works Company for the water works system which it had operated for about twenty years, the city determined to build a new system. When an ordinance was adopted in March, 1902, providing for the issue of $260,000 bonds to pay for the works, the Appleton Water Works Company brought suit and obtained a temporary injunction restraining the city from issuing bonds or entering into a contract. Judge Burnell decided to continue the injunction in force, on the ground that "it is best for all parties to wait before proceeding further, until a decision can be had from the supreme court on the doubtful questions here involved." This decision is sustained by the supreme court.

Louisville Property-Owners Must Pay for Pavement.

Judge Miller handed down an opinion Jan. 3 in the suit of the Barber Asphalt Paving Company against L. H. Wymond and others at Louisville, Ky., to collect the cost of constructing Park-place, from Third-ave to the crossing of the Southern Railway Company. The payment of the warrants for the work was resisted on several grounds, one of which was that the work was reconstruction, and that the city should, therefore, pay for it. Judge Miller overruled this contention and gave the Barber Asphalt Paving Company judgment for the amounts sued for.

Law Combining Water and Sewerage Boards of New Orleans Declared Invalid.

The Louisiana Supreme court handed down a decision January 16 in the case of Eugene D. Saunders vs. Dr. Quitman Kohnke, et al., (the merger case) declaring the merger law, passed at the recent session of the legislature, invalid, and the newly appointed members not entitled to seats.

In a contention over the proposed purchase of the physical works and alleged franchise rights of the old New Orleans Sewer Company, it became apparent that the water and sewerage board, then composed of 15 members, would have to be enlarged. The question had been passed upon by the board upon the recommendation of the executive committee of that board, of which Louis Johnson was chairman. Owing to the fact that the sessions of this committee were executive, the public had no information of what had really taken place before the purchase, or the proposed purchase, was sent to the city council for its ratification. The council referred the matter to its committee on water and drainage. When the public learned that it was proposed to pay the old sewer company the sum of $295,000 together with the remission of back taxes due the city by that concern, a vigorous protest was set up in behalf of the people by the States. The council ratified the purchase of the old concern and its alleged claims, despite the protests made. The taxpayers then sought an injunction against the boards expending so vast a sum of money for old and worthless property and for claims that had no existence. In a decision handed down by Judge Ellis, of the civil district court, May 15, 1902, this injunction was made permanent. Judge Ellis upheld the rights of the people and declared null and void the alleged franchise of the New Orleans Sewerage Company. This decision was given in the June, 1902, number of Municipal Engineering. The conditions for which the law provided that the drainage and water board should be merged or consolidated, had, in the meantime, been taking shape, and the time for the required consolidation was at hand when the last session of the General Assembly of the state began. The revelations and develments of the investigations of the question of purchasing the sewer concern's property, both before the council and the court, had been sufficient to force the presentation of some plan that would be a safeguard to the taxpayers. It became evident that the enlargement of the water and sewerage board was desirable when it was learned that some of the members of the board had prepared an act through which, in the merging of the two commissions, the membership of the consolidated board would be made smaller. The proposed act provided that the three members of the Orleans levee board should be dropped. It was then that the fight was begun, and finally resulted in the enactment of the law that increased the membership of the consolidated water and sewerage board from 16 to 21 members, the additional members being the labor bureau commissioner, the president of the city board of health, a representative of the board of port commissioners, one representative taxpayer from the upper districts of the city and one from the lower districts.

The decision of the Supreme Court

leaves the water and sewerage board as it was before the legislature passed the merger law.

Municipal Lighting Plant Is Now Possible in New Orleans.

The Supreme Court of Louisiana has rendered a decision nullifying the acceptance of the Bullard bid for the erection of a municipal electric lighting plant in New Orleans. The Supreme Court holds that at the time the city council accepted the bid it had no right or authority to anticipate the revenues. Since the bids were received, however, legislation has been secured remedying the flaw upon which the court based its opinion, and the city is now free to contract for a public lighting plant.

New Jersey County Park Act Is Constitutional.

The Supreme Court of New Jersey filed an opinion Jan. 16 affirming the constitutionality of the Essex County Park act. The decision is said to be important, inasmuch as it holds to be good the act providing for the creation of county park commissions, under which the Essex County park board exists. The creation of a park commission is also contemplated by Hudson county. While the opinion fails to settle the question as to the validity of the appointment of the park commissioners by a supreme court justice, it in effect declares that the manner of appointment is a minor consideration, in no way affecting the constitutionality of the act as a whole.

INDIANA ENGINEERING SOCIETY.

Proceedings—Bituminous Macadam—Bituminous Filler—Stream Pollution—Municipal Lighting Plant—Interurban Railway—Concrete Steel Construction.

Twenty-Third Annual Convention of the Indiana Engineering Society.

The Indiana Engineering Society is now an incorporated body, starting with a membership of more than ninety. Its last convention, held Jan. 15, 16 and 17, at Indianapolis was very successful, in attendance, in general average of papers presented and in the interest of the discussions. Abstracts of several of the papers presented are given herewith.

A pleasant feature of the convention was an excursion over the Indianapolis, Shelbyville & Southeastern interurban railway by courtesy of Townsend, Reed & Company and their engineer, Mr. R. P. Woods.

The officers for the ensuing year are Professor R. L. Sackett, Earlham College, Richmond, President; R. P. Woods, Indianapolis, Vice-President; Charles Carroll Brown, Indianapolis, executive secretary and treasurer; J. S. Spiker, Vincennes, F. W. Keller, South Bend, C. G. H. Goss, Martinsville, and J. S. Humphrey, Indianapolis, Board of Trustees.

Professor W. D. Pence, of Purdue University, discussed the subject of engineering education in his President's address, and Paul W. Covert, instructor in the Indianapolis Manual Training High School, considered the manual training high school and its benefit to the training of an engineer.

The electric lighting and power plant recently erected by the city of Richmond was described by the designing engineer, J. B. Nelson, of Indianapolis. An abstract is given below.

The new sewer system of the city of Lebanon was described by the city engineer, Mr. J. W. Fulwider, and the new Northwestern avenue sewer of Indianapolis, partly in concrete steel, was described by the assistant engineer in charge, Mr. Walter Buehler.

Mr. J. S. Humphrey of Indianapolis, formerly the city engineer of Alexandria, gave a valuable paper on the city civil engineer and his work in small cities.

Concrete-steel and bridges had a good measure of attention, with papers by D. B. Luten of Indianapolis, showing the different forms of concrete-steel arch construction; by H. C. Brubaker of Indianapolis on building construction, and by Frank L. Wolfer of Pittsburg, Pa., on the subject "More Economy in Our Highway Bridges."

The water question was well represented with papers on the new filtration plant of the Indianapolis Water Company by L. K. Davis, on "Stream Pollution and a Remedial Policy" by M. O. Leighton of the U. S. Geological Survey.

Pavements were considered by C. A. Kenyon in a paper on "Warren's Bituminous Macadam," and a short note on bituminous filler for brick pavements.

The Shelbyville interurban railway was described by R. P. Woods, the engineer for the construction, and the experimental coal-dust burning plant of the Indianapolis Water Company by F. A. W. Davis, the general manager.

Professor W. K. Hatt of Purdue University presented the report of the committee on materials of construction, which was largely devoted to reinforced concrete.

Abstracts of some of these papers are given herewith.

The next meeting of the society will be held Jan. 14, 15 and 16, 1904, at Indianapolis.

Warren's Bituminous Macadam Pavement.

By C. A. Kenyon, Indianapolis.

The name "Bituminous Macadam" was selected by Mr. Warren as descriptive of its construction. It is a stone pavement—macadam stone, that every one understands—mixed with bituminous cement. It combines the good qualities of macadam with the best qualities of the asphalt pavement.

Every engineer knows that a very good pavement can be built of broken stone without any cementing material. The coarse angular particles of stone, when submitted to heavy pressure, fit and wedge themselves together in such a way that the resultant mass has great strength and will bear great loads practically commensurate with the strength of the stone. The mass thus laid will have, with three-inch stone, from 40 to 45 per cent. of voids. These voids, while not uniform in size, will be large compared with the voids in one-half-inch stone. In other words, there is a very large percentage of the interstices in a mass made of three-inch stone in the manner indicated that are practically uniform. I will say that practically none of the interstices are one inch in size, therefore, if any considerable number of stones one inch in diameter are incorporated in the mass described, such stones do not fill voids, but have a tendency to prevent the larger sized stones from wedging together, and really increase the voids instead of decreasing them. This seems a simple truth, almost axiomatic to hear it stated. When I first heard it I thought I had always known it, but upon careful thought, I had to confess that if I had, it was so poorly and indefinitely formulated that it had been of no value to me, and really I did not know it in any practical way. If you desire to test your own knowledge of in the matter ask yourself what is the size of, say 60 per cent. of the voids in a rolled mass of crushed rock that breaks with a conchoidal fracture (for the size varies with the character of the fracture), and I think most of you will arrive at the same conclusion that I did. Yet, to know that size and to know the percentage of stones of that size that would go in those interstices without preventing the larger stones from wedging together, to give rigidity to the mass, is most important, and after that is known, to know the percentage of a still smaller size that will fill, under the same conditions, the smaller interstices in this second lot, and so on down, diminishing the size of the filling stones as the interstices diminish in size, until you arrive at an impalpable powder. The proper incorporation of this impalpable powder filling in a great many little places, as it were, that might have been overlooked, is a most essential feature.

John Macadam, in 1816, discovered the value of wedging the large stones together by heavy pressure. He also knew that this gave rigidity but not density. Water found its way down through the mass, softening the stone as well as the foundation. He also discovered that some small stones added density to the mass, but this was merely haphazard, and from his day until Mr. Frederick J. Warren worked out the rest of the problem, learning on this subject has not advanced. Mr. Telford, to be sure, in 1820, having discovered that the water seeped through John Macadam's surface and wet the foundations and permitted the pavement to settle, invented what is known as the Telford base. The students of macadam pavements from his time until Warren's have gleaned only straw and chaff. Macadam has been worked with by nearly all the civilized nations on the globe, and thousands of miles of fine roadways are the result, but, with the exception of a little more care in the selection of the stone, a heavier roller, some faint and often abortive efforts to find a binder to exclude the water, a better system of maintenance, macadam is the same now that it was seventy-five years ago.

Through all the centuries of Greek and Roman civilization, in fact, down through English and French civilization, to the beginning of this century, no one had the creative mind to discover the way to build a good road with broken stone. How stupid! But, just as soon as people saw how simple it was, many said John Macadam claimed to have invented a new road. Any fool could do all he did.

But the decades passed and no one improved on his method. Wood was introduced in London in the thirties; asphalt

in Paris in 1854, coal tar pitch mixed with gravel, sand and stone screenings in the United States in the sixties, but still no improvement in macadam.

Macadam had its virtues, and while it had many defects, the virtues predominated, especially for roads through the country where the traffic was not heavy, but in cities the expense of maintenance has almost driven it out.

Just think again what a boon it was. In place of rough stone blocks and cobbles it is smooth, easy of traction, quiet, with an excellent footing for horses, capable of bearing great loads, made of stone, the most durable of materials. It had and has its defects also, and especially for cities. Rains and water ravel and wash it badly, so that tons of the road metal go into the sewers or are washed away by each storm. Water goes through it and softens the foundation, and it loses its grade. The fine metal on the surface mixes into a pasty mud. In dry weather that mud becomes dust, high winds blow it off the road, and it must be replaced at great cost. It must be sprinkled. It is costly to clean because the economical sweeping machines cannot be used; it must be cleaned by hand. It is costly to maintain. So, you see, this fine pavement had many disadvantages as well as virtues. It needed some one to improve it, to retain its virtues and to abolish its faults.

Frederick J. Warren had been working in the manufacture of bituminous materials and asphalt pavements all his life. He is a genius with a creative mind. He set about to finish, round out and complete the work John Macadam and Telford had begun, and I believe he has done it in the invention of Warren's Bituminous Macadam Pavement.

He took a cubic foot of solid stone, fitted a box over it, weighed the stone, and then broke it into pieces about two inches in diameter, attempted to replace all the stone in the box, and but little more than half in volume or weight would go back into the box. He undertook the task of so breaking and arranging the sizes of that remaining out of the box, that he could place it all back into the box. The task was as difficult, as was the task of squaring a circle, inventing perpetual motion, or discovering the philosopher's stone, none of which has been or ever will be accomplished, but thousands of men with the industry of genius have worked at these problems, and many useful inventions have resulted. And so it was with this. Fred Warren did not put all of that stone back in the box, but he did put 90 per cent. of it back, and discovered and formulated the principle whereby, with predetermined proportions, he can accomplish practically the same result every time.

No one had ever done it before, and if it seems easy to you, or you feel inclined to say of him as was said of John Macadam, "Why there is nothing new about that, any fool can do it," my advice is to try it. You will do doubt see the advantage of it from a road builder's standpoint, but you will not be able to do it until some one shows you, and then, like most of the things genius does, it seems simple enough.

After Mr. Warren discovered a way to reduce the voids in a mixture of stone to 10 per cent., the work was not finished. In order to accomplish a useful result, he must find a way to get that compact mass of stone within 10 per cent. of a solid, into a pavement surface, and keep it there. He finally decided that a bituminous cement of great uniformity and durability in all temperatures of the atmosphere, one that should be absolutely unaffected by water, and one with great cementing strength, was necessary, and, with equal industry he undertook that task. The result was what is known as Warren's Puritan brands of bituminous cements.

Of course all of this had to be followed by the devising or inventing of appropriate bins, screens, mixers, heaters and machinery for the manufacture and laying of the pavement. All of this has been accomplished, and over 600,000 square yards of pavement laid in about two years, and $750,000 have already been invested by various companies in the industry.

It is constructed with from four to six inches of two and one-half to three inch crushed hard stone foundation, laid on a thoroughly compacted subgrade. This foundation is thoroughly compacted by a fifteen ton road roller and brought to a true surface. Hot bituminous cement is then poured over the surface so that it will run into the interstices, thus binding it together and making it waterproof. Many of our best engineers favor this form of foundation in preference to hydraulic cement concrete, which is pervious to water and has not the advantage of having been wedged into place by the use of a heavy roller. The concrete foundation for any pavement, is of recent origin; the first one used in London was in 1872. On top of this foundation is placed the wearing surface or pavement proper. The broken stone is heated in revolving drums, to about 200 Fahrenheit and then by carefully arranged screens separated into sizes and deposited into separate bins. From

each of these bins, can be drawn the exact amount of the particular size in that bin required, the aggregate of which, when brought together, typifies the result of Mr. Warren's labors, and when placed and compressed into a mass, approaches to 90 per cent. of a solid stone. This aggregate is then placed in a turning, mechanical mixer and the heated bituminous cement, by exact weight, poured in and the mixing continued until every piece of stone from the largest to the finest powder is covered with a thin waterproof coating of the bituminous cement. It is then dumped into a wagon and hauled to, and deposited in a layer or sheet on the foundation prepared as above described, and then rolled with a fifteen ton road roller.

The result is practically a solid. It is rigid because the large, angular stone in the mass are wedged together. These large stone thus wedged would bear the weight of any load likely to be hauled over them, without the use of any cementing material. It is, therefore, not necessary, as it is in the construction of an asphalt pavement, which is sand mixed with bituminous cement, to have the cement so stiff or hard that under all atmospheric conditions the cement is strong enough to hold the grains of sand in a column. The sand without the cement, no matter how arranged, will not bear any load.

The smaller materials fill the voids in the larger materials, thus giving great density, practically the density of a solid. We have now added density to rigidity: Improvement No. 1.

The bituminous cement makes the pavement absolutely waterproof, Warren's cements being unlike Trinidad asphaltic cellent, which is affected, as most of you know, by water. This is improvement No. 2.

The bituminous cement holds the fine material in the interstices, preventing it from shifting or going to the bottom as in the ordinary macadam, and also preventing the pavement from rolling into waves, which is a common fault of the asphalt pavement. This is improvement No. 3.

The cement forms a cushion between the stones and prevents them from rubbing against one another; this makes the pavement elastic and quiet. Improvement No. 4.

In such a dense and rigid mixture, the exposure of the cementing material is reduced to a minimum; this permits the use of a softer bituminous cement. (The softer, the more exposure it would require to render it inert, or make it lose its cementing quality). It is believed that, therefore, the cement will retain its cementing property much longer in this form of pavement, than cements will in the asphalt or sand mixtures. By this means, the pavement lasts as long as the stone lasts, which gives great durability to the pavement. Improvement No. 5.

It, being waterproof, homogeneous and dense, rain and water cannot wash, or wind blow, any part of it away. It can be flushed with water for cleaning, or swept with a sweeping machine. A most important advance over macadam. Improvement No. 6.

The surface of the pavement is slightly indented by the laying of the stones. A flush coat of quick drying cement is poured on and squeegeed into these indentations; a sprinkle of fine sand and screenings is then spread over the surface and rolled in with the heavy roller. By this means, while the pavement has a surface for the wheels equal to asphalt, it provides a foothold for horses equal to macadam. Improvement No. 7.

This, in short, is a description of Warren's bituminous macadam pavement, and the method of its construction. It is entirely different from the asphalt and macadam pavements and if it has some of each of these pavement's features it appeals to the ordinary every-day man as well as to the engineer.

The Advantages of a Bituminous Filler for Brick Pavements.

The proper treatment of the interstices of brick pavements is quite as important as the selection of proper brick and of providing a suitable foundation, yet it is a feature very often neglected; probably not so much neglected as it has been difficult to obtain a suitable filler—a filler which will add to instead of detract from the merits of this kind of pavement.

The two generally accepted fillers, other than the use of sand, are coal-tar pitch and cement grout. Experience has demonstrated that there are serious objections to the use of both, for the properties desired by engineers and essential to the pavement are not obtained by the use of either. The specifications for the use of cement grout are specific, designating the quantity and kind of cement and the quantity of sand to be used in its making. Those for coal-tar pitch simply designate coal-tar pitch or coal-tar pitch No. 4 or No. 6, with sometimes an admixture of asphalt and residual oil. The numbers are arbitrary terms in use at the refinery and are meaningless so far as indicating the chemical or physical properties of the material. In other words, the No. 4 pitch from one factory will be very different from the No. 4

pitch from another factory, because of the difference of coals and methods used by different gas companies in making gas. Of course the tars are necessarily different, yet at the tar refineries the tars from all gas companies, without regard to quality, are mixed. It would be impossible for the tar refineries to separate in tanks the many varieties of tars, they are so numerous. A No. 4 pitch means that 10 per cent. of the whole quantity of tar put in a retort is distilled therefrom; 15 per cent. means a No. 6 pitch. For instance, if there are 100 barrels of tar in distillation and 10 barrels are extracted from it the remaining 90 barrels would be termed No. 4 pitch; if 15 barrels are extracted that portion remaining in the still would be termed No. 6 pitch. Fifteen or twenty years ago the usual size still used in the distillation of tar in this country was of 40-barrel capacity; 10 per cent. extracted from one of these stills gave 4 barrels, 15 per cent. 6 barrels and 20 per cent. 8 barrels, hence the designation of the pitch remaining in the retort was given as 4, 6, 8, etc.

Engineers have been quick to detect these irregularities in the quality of pitch, and while maintaining that a bituminous filler of a good quality, everything considered, is the best filler to use, yet they have been forced to adopt either sand or cement grout. The bituminous filler for granite pavement in New York, for instance, provides for the following: 100 pounds of pitch No. 4 grade, 20 parts of asphalt and 3 parts of residual oil, to be mixed on the street. Note the indefiniteness of these specifications: "The paving cement shall be composed of 20 parts refined asphalt, the quality to be approved by the engineer, and 3 parts residuum oil, mixed with 100 parts of coal tar, which shall be obtained from the direct distillation of the crude material, and shall be such as is ordinarily numbered 4 at the factory. These materials to be mixed on the street." There is nothing specifying the physical properties of the coal tar, notwithstanding the variation in the quality of the No. 4 pitches; there is nothing said as to the quality of the residuum oil, whether it is to be petroleum or other product. Of course, there is the provision requiring that these materials shall be submitted to the engineer before the contract is to be let, for examination, but even with this provision the specification is indefinite, and to examine the three materials separately would not determine the physical or chemical character of the material when used as a whole in the street.

But assuming that it were possible to get a uniform material of good quality, coal tar pitch is not an acceptable bitumen material for use as a filler. Its range of usefulness is probably 20 degrees, say from 50 degrees Fahr. to 70 degrees Fahr. Then it has but the one property of making the pavement water tight. To use coal tar pitch the joints must be first filled with sand or gravel up to within an inch of the top and then the remaining inch be filled with it. If the work is well done and the temperature does not go higher than 70 degrees, nor below 50 degrees, the pitch is likely to remain; but this is a climatic condition not obtainable in any section of this country. We get it very much below 50 and very much higher than 70. Above 70 the pitch will flow, and below 50 it becomes so brittle that the vibration of the pavement and the corks of the horses shoes will crush and crumble it to dust. If the street be swept or cleaned even by natural conditions, before the thermometer registers 70 degrees or above, the pitch is moved from the joint just like so much dirt, thus leaving the substructure unprotected from moisture.

A filler should be more than a permanently water tight material at any temperature. It must be self "sustaining; that is, it should not lose its form when exposed to high heats; it should not become brittle at low temperatures; it should provide for the expansion and contraction of the brick or other materials used in the construction of the street; it should reduce to a minimum the noise from the pavement. In other words, a bitumen should be used which will compress when the brick expands; expand when the brick contracts; deaden the sound; and make a permanently waterproof surface.

A bitumen made by the National Bitumen company, of Chicago, is about to be placed on the market which it is claimed, will answer all these requirements.

Brick and granite block pavements are extremely durable, but the noise from each has been the greatest objection to their use. Now they can be constructed so that this objection can be very largely if not entirely overcome. Two specifications could be used, i. e., 1st, make expansion joints of the bitumen alongside the gutter and every 100 feet across the street. 2nd, if it is desired to lay a higher class brick pavement, and one that is no more noisy than any of the pavements in use to-day, the interstices could be filled as well as the expansion joints. This would make an extremely desirable residence street. Either the first or second specification will guard against the hollow sound so frequently heard from brick pavements.

This bitumen does not require the ad-

mixture of any material with it. It will set and remain in its place like cement grout.

Stream Pollution and Remedial Policy.

By M. O. Leighton, U. S. Geological Survey.

The hygienic significance of river pollution has grown very narrow. In former years, when we conceived that the plague and the pestilence lurked in the fetid vapors, in foul odors, in miasmas and effluviae, a polluted stream was logically a thing for sanitarians to conjure with. But gradually our beliefs have been changed, and we have found by progressive steps that our health is less in danger from foul water, until now it is conceded that, in order that a person may be injured by it, he must actually pour it into his mouth and swallow it. Therefore the only feature of stream pollution which remains of professional interest to the sanitarian, is that of the protection of waters used for domestic supply.

We shall find that the reasons which make stream pollution undesirable are economical ones. Water is a source of wealth, the magnitude of which appears greater and greater the more we ponder upon the subject. It will not be necessary for me to review before this company, the special lines of utilization to which water is applied. You know the importance of conserved water in power development in city supply, in ice supply, in irrigation and fisheries. You will appreciate also that in many of these lines of special development, polluted water cannot be safely used; therefore pollution is a damage to natural water resources. An engineer is, above all things, one who preserves and develops natural resources, and therefore the consideration of river pollution is, of right, one of the duties of an engineering society.

You have taken up the study of river pollution with the purpose in view of applying, or assisting in the application of remedial measures. It is, or should be, a conquest in which you have a definite plan of campaign, the issues of which are logical and definite, and the points of attack the most vulnerable that can be found. Wasted effort before an impregnable barrier is heroic while it lasts, and highly entertaining to the spectators. More creditable it is to seek out your opponent's weak points, and thereby bring about a few results.

For years we have been preaching the gospel of sanitation to our legislators and our makers of history; we have upheld in glowing rhetoric divers humanitarian principles, we have pointed to the bodies of the dead, have echoed the wails of the suffering, and we have been laughed at for our pains. If you will glance about the world you will see the wonderful improvements in all matters pertaining to the physical health and comfort of the human race; this is readily admitted; but how much of this, think you, would have been brought about if health and comfort had alone been considered? Do you know of a city in this broad land that has installed a system of water filtration because of the sufferings of its inhabitants? Those which I have been familiar with, have been constructed because the poor water and high death rate resulted in a bad reputation abroad, in decreased business and drops in real estate. You may bellow at a city until you are black in the face but no change will come until some one's pocketbook is hit. In your own state of Indiana your health officers have been insulted and scorned in their efforts to save lives, and they have rarely or never had any support or decent treatment until the conditions which they were combating grew formidable enough to hurt business.

Therefore, I counsel you in your struggle against stream pollution, to avoid the subjects of health and sanitation. Meet this mercenary state of society with a mercenary argument; talk dollars and cents, even if you are reduced to a consideration of the pecuniary value of lives lost in an epidemic. You will always have an audience under such circumstances, and you can make it move with a few calculations based upon loss in the coin of the realm, for it is money that makes social, commercial, and, sometimes, legislative wheels go round. If you take up a foul stream for discussion and calculate the value of the water in its pure state, as a source of water and ice supply, as a means of developing power, as a useful agent in manufacturing, as a home for fish, and as an agent in enhancing the value of real estate, you can produce a column of figures that will make anyone interested. Then if you calculate the amount of damage, in dollars and cents, wrought upon water and ice supply, if you figure up the thousands of pounds of dead fish, if you show a picture of corroded boilers and of ruined manufactured articles, and give a hint as to how much it cost the manufacturer to replace that foul water with a pure supply; and, finally, if you figure up the losses due to decline in real estate in the vicinity of this foulness, you will meet a response from your audience that will gratify you beyond your expectations.

Let us now consider the concrete subject of pollution: It has been found convenient to divide the subject into three classes, each based upon the source

from which the contaminating matter arises: First, the natural pollution, which must, of necessity, be carried into streams along with the water from occupied lands or tilled fields, irrespective of any drains which may enter the stream; second, household sewage consisting of the excrements from man and the refuse occurring in his domestic economy; third, wastes from industries. Taking for consideration any stream which flows through Indiana, the one most familiar to any of you, let us see how it is affected by each of these classes or grades of pollution.

This stream, flowing through inhabited territory, must have characteristics which it did not possess when it coursed through a primeval country. If the country is thickly populated, it will very likely be polluted by natural drainage to such an extent that some of these values which I have enumerated will be damaged or destroyed. This is especially true in small streams. Nevertheless, if you are a riparian owner upon that stream, and are damaged by any such natural drainage, you are not entitled to any consequential damages. It is like a governmental act, the consequences of which must be borne by all to whom it applies, or a state of war, the devastation of which is visited upon you without recourse. The damage caused by such pollution must be regarded as the price which society must pay for its social and economic development. Here we must begin our computations of the effects of pollution, not with the river in its pristine purity. Some agitators forget this. They overlook the fact that some degree of contamination is irremediable, and, in striving to restore the primeval condition of a stream, they throw discredit upon themselves and upon their cause.

This important matter must be taken into consideration in connection with the next two classes of pollution, for, if it is ascertained that any city or any industrial plant pours into a stream a substance which is, or which will become no more serious than that which arises from the natural drainage, that city or industry cannot be regarded as in any degree damaging to lower riparian owners.

Pollution by city sewage has undoubtedly more direct sanitary interest than that by industrial wastes, for it contains usually the germs of a certain water-borne disease. It is a substance which intimately mingles with the water of the stream, and in varying periods of time, depending upon numerous natural phenomena and conditions, goes into solution, and is finally resolved into the inorganic constituents from which it is made up.

It will not be necessary for me to discuss before this audience the effects of sewage pollution. It is a subject which has been extensively studied, and the developments have been so satisfactory that the interest therein has well nigh lost its novelty. It is not possible to purify the sewage of a city so that it will be constantly safe for domestic supply. No well-considered reform movement will attempt to effect such a result, and, indeed, such a result is not necessary. We need only be certain that the effluent from our sewers be purified to a point that it will not serve to increase the organic ingredients in the water, which, as just explained, must necessarily be brought there by the natural drainage from occupied land.

This matter of sewage purification is a simple one. It can be readily understood by the untrained mind. It should be stripped of its mysticism, relieved of its delightfully indefinite vocabulary and placed before the "city fathers" with the clearness and simplicity of a junketing trip. If we are ever successful in securing the general acceptance of sewage purification works by cities in this country, it will be only after we have convinced the public that our notions are not chimerical.

In taking up the subject of industrial wastes, we encounter the problem of the future; the most interesting, most poignant in the realm of water pollution. This may be due in part to the fact that, in every organic waste, there are ingredients which are generally fit for utilization when recovered. Indeed, there is excellent ground for the belief that there should be no such thing as industrial wastes, and the time is coming when the existence of such will be considered an evidence of poor business management. In many cases, the wastes of a few years ago are now utilized at a profit greater than that obtained from the original manufactured product .

The efforts toward the utilization of the valuable ingredients in city sewage have not been productive in America, although in Europe there are several successful plants. It is believed that the great dilution occasioned by American extravagance in water consumption is responsible for this lack of conspicuous success in the United States. We know, of course, that the material is there, but its recovery is a problem analogous to the recovery of gold from sea water. In dealing with the purification of industrial wastes, however, we are brought face to face with the great possibilities of utilization. This is both interesting and fortunate; on the one hand, a fertile field of investigation is presented, while on the other, the possibility of profitable recovery will enlist the assistance of manu-

facturers in securing the purification of streams.

In dealing with the industrial pollution of streams we can do our most effective work along this very line of utilization. If we walk up to a manufacturing establishment and demand that certain wastes be summarily removed from a stream, the response which we receive will not be cordial, even though we have all the laws of the land at our backs. Here in Indiana you have been striving vainly for years to secure effective legislation on the subject. I do not understand the value of special legislation; it is necessary for public safety that we provide specific laws to meet emergencies, but I am of the opinion that consideration, tact and good management will, in the end, be more efficacious than badly-administered prohibitory laws. Their summary application leads generally to strife and civil suit; corporation lawyers can do wonderful things if there be so much as a pin hole in our armor, and there is always an uncertainty arising from the construction which courts put upon special legislation. If, however, we approach a corporation with suggestions concerning purification and utilization, we secure generally their aid and cooperation.

In advancing such a doctrine I realize that I am at variance with many wise men. The procedure advocated by them is practically as follows: Secure the passage of prohibitory laws, and then demand of offenders that they mend their ways. It is not the duty of the authorities to prescribe methods by which they shall bring about their improved conditions, but the work rests solely upon the shoulders of the offenders. "Why," they say, "should a corporation, already overrich, profit by suggestions and experiments made at public expense in order to secure immunity from the very overt acts which that corporation is committing?" That argument would be unassailable if the corporation were the only one to profit. But there is a large community of interests which suffers from those overt acts, and those interests should speedily be protected. If an incendiary starts a conflagration in your city, the fire department is called out to protect the surrounding interests, at public expense. You don't catch the offender and order him to think out a method of extinguishing the fire. The parallel between these two cases cannot be extended indefinitely, but the governing principles are identical.

Again, there is the objection that it is unwise for a public authority to undertake the responsibility of prescribing means which may be unsuccessful after installation. There is much justice in this contention, but it may be answered in this manner: If you set yourself up in the business of stream purification, if you venture to administer laws framed for this purpose, you carry a certain amount of dignity which arises from the assumption that you are an authority on those matters, as, indeed, you should be. Now, if a person, or association of persons, upon whom you have made demands, comes back at you with the statement that he or it will do anything you will prescribe, the matter is squarely up to you; not legally, but logically up to you.

According to the ideas held by many wise men ,the only thing which you can do is to decline the responsibility; to use a homely, but highly expressive phrase, you must "crawfish," and the minute you crawfish, you lose your grip. You have no logical right, as an authority, to assign to any man a problem or a duty that you are afraid to take up yourself. Therefore, I contend that it is expedient to do a thing which, from an initial view-point, will benefit an offender. I believe in the eternal wisdom of expediency, so long as we remain honorable in our practice of it.

Finally, I wish to make a few observations concerning proceedings which should be taken against corporations, public or private, which unlawfully pollute natural water courses. I have no apoligies to make for any of these offenders, and do not seek to justify in the slightest degree any act which uncessarily damages natural resources. At the same time I would recognize the rights of all parties in any contest.

The riparian rights of a corporation which furnishes a market for raw products, employs large numbers of men, and produces a necessary or useful commodity, are as good as those of a lower riparian owner who farms his land or leaves it unproductive. The converse is equally as true.

Streams which run through a country are the natural drainage outlets of that country, and liquids must run down hill into them. It was held, in the beginning of this address, that streams running through inhabited lands must be polluted to a degree varying directly with the population. Therefore, any person who adds pollution to a stream, which does not increase the organic constituents of the water thereof to a degree higher than that already established at centers of population, should not be held accountable. The degree of pollution established by natural causes is inevitable and he who remains within those limits is immune.

I have found, from general observation, that there is a demand among the

anti-pollution agitators that the affluents from sewers and industrial plants be pure and undefiled. This is unreasonable; you cannot expect any corporation to do more for you than nature does, and it is only by making reasonable requirements that we can hope for success.

In this paper I have dealt at considerable length upon the limitations which should obtain in all requirements made for the purpose of stopping stream pollution. I do not, however, wish to be understood as advocating any compromise. The damage to our streams must, and eventually will be recompensed, but in bringing this about, it is better, wherever possible, to assist an industry rather than to shut it down. No great and lasting reforms have even been hewn out with a sharp ax, and this certainly is the guiding principle which controls the operations of the national government in the work of improving water resources.

Richmond, Indiana, Municipal Electric Lighting and Power Plant.

By J. B. Nelson, Indianapolis.

Dr. W. W. Zimmerman, the present mayor, was elected in 1898 on a platform advocating municipal ownership of the water works and electric lighting plants, both at that time under the control of private corporations. A contract had been entered into with the Richmond Light, Heat and Power Company for lighting the streets for a term of ten years, from July 1, 1894, the city agreeing to use not less than 150—2,000 c. p. arc lights at $90 per annum. About 180 lights were in use at this price, a number of small gas lamps also being used for street lighting, the rate for these being $20 per annum. This company owning the gas works as well as the electric lighting plant, encouraged the use of gas for commercial and domestic purposes and made no effort to extend the electric lighting service, having in their power station for incandescent lighting only a 75 K. W. generator, which was not operating at its full capacity.

Mayor Zimmerman had almost the unanimous support of the fourteen members of the common council in his efforts to build a municipal plant. Immediately after the May election in 1900 the matter was taken up in earnest and after several council meetings had been held to discuss the matter on August 6 of the same year plans and specifications were ordered prepared.

After a careful consideration of the existing conditions I recommended the installation of multi-phase generating apparatus, and as it was believed that the plant would eventually have a considerable motor load three-phase generators were selected. The question arose as to whether it were better to use three-phase or two-phase apparatus and it is possible that others might have decided in favor of the latter. Thus it is possible to operate everything—both arc and incandescent lamps in series for street lighting, multiple arc and incandescent lamps for commercial lighting, and motors for power, from the same dynamo. This is in accord with the best modern practice and permits the use of larger and more economical units. The multiplicity of small machines, a separate kind for each service, so common a few years since and still to be found in many central stations, is no longer permissible in an up-to-date plant.

The location first selected for the power house was near a small lake fed by numerous springs in Glen Miller park. The plans and specifications were prepared for power house located at this point, competitive bids were received Jan. 3, 1901, and the contract awarded about ten days later.

In the meantime a new railroad was being built into the city. It was finally decided to seek a new location for the power house and a point was selected in the river bottoms, accessible from the new railroad. This, of course, necessitated entirely new plans for the power house and a complete revision of the different circuits for light and power and caused a further delay, but no change of any consequence was made in the station equipment. The work of construction finally began about June 20, 1901. The plant was not completed and accepted by the city until about thirteen months later.

Engines and Generators—The power station has two main generating units, exactly alike except as to size, space being provided for the installation of a third similar unit in the future. The larger unit consists of a 650 H. P. cross-compound engine direct connected to a 450 K. W. generator; the smaller unit consists of a 450 H. P. cross-compound engine direct connected to a 300 K. W. generator. Both units operate at a speed of 150 R. P. M., the generators being arranged to run singly or in multiple, at will.

The generators are of the three phase, 60 cycle, 2,300 volt, revolving field type, manufactured by the General Electric Company, and represent the very highest development in alternator construction. They have a guaranteed efficiency at full load of 93½ per cent. Incidentally the high speed effected a material saving in the cost of the generators themselves.

For exciting the fields of the alternating current generators, there are two 15 K. W. 125 volt direct current General

Electric generators, each direct connected to a 7x8-inch center crank Alfree engine, running at a speed of 400 R. P. M.

Switch Board—The switch board consists of six polished marble panels 30x62x2, each on a sub-base 30x28x2. There are two generator panels, one exciter panel and three three-phase feeder panels. On each generator panel is mounted one indicating watt-meter; one volt-meter; three ammeters, one in each phase; one direct current ammeter; one triple-hole, single-throw oil break switch; two potential transformers; one synchronizing plug and lamp; one field switch. The exciter panel is arranged for controlling both exciters and has mounted thereon two triple-pole, single-throw switches; two ammeters; one volt-meter; two rheostats; one volt-meter switch. The feeder panels each contain two ammeters; two triple-pole, single-throw oil brake switches; six expulsion fuse blocks. Mounted on the switch board are also two single-phase electro-static ground detectors, on swinging brackets.

The specifications provided for three 100-light 6.6 ampere constant current "tub" transformers, for operating the series arc street lamps, but two of these were omitted until after the additional lamps (referred to later) are needed. The transformer installed has a small switch board panel of its own, with necessary apparatus for controlling it.

Two three-phase recording watt-meters register the output of each generator, so that it is possible at all times to know just what the plant is doing.

The engines and boilers and the tests of the same were fully described in the paper.

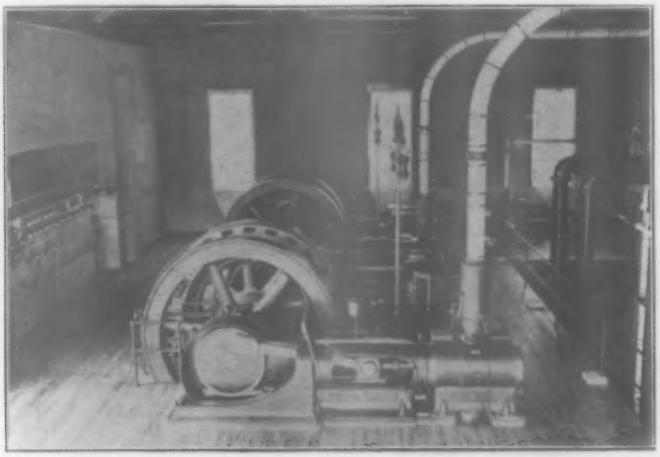
Lighting and Power Circuits—There are 255 arc lamps arranged in series in four circuits, the greatest number in any one circuit being 75, and the least number 55. In the former circuit are also 14, 100 c. p. incandescent lamps for lighting a small park. For commercial and domestic service the city was divided into six districts, there being four feeder circuits leading to four separate centers of distribution, and one feeder circuit having a primary and a secondary center of distribution; serving practically the whole of the city. No services are taken off the feeders, which were calculated for a uniform drop in potential; primary mains radiating from the several centers of distribution. There were also erected fourteen 15 K. W. transformers having 2,000 volts on the primary side and 115 volts on the secondary side, each transformer having its system of three wire secondary mains. These large transformers were located in sections of the city which were most closely built up. A number of smaller transformers were furnished, to be erected as needed. The feeder circuits to the centers of distribution are all three-phase, delta construction. The primary mains where there is any probability of a motor load, and when necessary to distribute the load, are also three-phase. The primary mains for lighting in residence sections are run single phase, care being taken to keep the load balanced as nearly as possible between the three phases. Lightning arresters were put on each feeder at the center of distribution and at intervals on the arc circuits.

No wire was used smaller than No. 8 B & S gauge. The largest feeder wires

ELECTRIC LIGHT PLANT, RICHMOND, IND.

are No. 2 and the smallest No. 8. The arc circuits are all No. 6. In the threewire secondaries from the 15 K. W. transformers the middle or neutral wire is the same size as the two outside wires; the largest wire used in the secondaries being No. 1. The four series are circuits for street lights, as planned, require approximately about 70 miles of wire or about 30 tons.

Building, Etc.—The accompanying photographs show the general style of the building. It is a substantially constructed brick structure on a concrete foundation. The character of the site selected, it being in what was at one time the channel of the river, made the foundations very expensive. Approximately 1,800 cubic yards of Portland cement concrete were used in constructing the foundations for the building, machinery and



DYNAMO ROOM, ELECTRIC LIGHT PLANT, RICHMOND, IND.

stack. It is well to take no chances with the foundations for a structure of this kind where heavy and expensive machinery is being used. On the east side of the building, next to the embankment, is a heavy concrete retaining wall, 3½ feet thick and 25 feet high, with a 5½ foot footing. This heavy wall forms the lower part of one side of the coal bins and also supports the last bent of the trestle carrying the spur from the railroad for unloading coal. The engine-room is 50 feet wide and 80 feet long, with a recess 8 feet by 24 feet for the switch board. The pumps and condensers are in a pit in the engine-room, on the side next the boiler-room, the floor of the pit being 10 feet below the level of the main floor.

Cost of the Plant—The contract price for the plant complete was $144,490, the contract being awarded to the Varney Construction Company of Indianapolis. This was the lowest bid, the highest being $161,450. The engineer's estimate of the cost was $152,790.

The omission of part of the arc lamps and two of the transformers; the curtailment of the arc circuits; and the modification of the feeder circuits owing to change in the location of the power house, decreased the cost materially, but this was very nearly offset by the very expensive foundations necessary for the power house and machinery in the new location, and some other changes made; so that the actual cost of the plant was a little less than $144,000.

The plant was accepted by the city July 26, 1902. Some time previous to this Mr. S. E. Gard, formerly superintendent of the municipal electric lighting plant at Mishawaka, Ind., had been employed as superintendent and had begun soliciting business for the new plant. But little could be done in this direction, however, until the plant was in operation. Under Mr. Gard's supervision the plant is rapidly acquiring a good business. At the beginning of the present year it had in operation 82 street arc lights (some of these being furnished by the railroads), 274 commercial arc lamps and approximately 9,000 incandescent lamps. But little power has been furnished up to this time. Everything is furnished by meter measurement. On the recommendation of the superintendent the following rates were established:

1 to 50 kilowatts per month.....9c.
50 to 200 kilowatts per month.....8c.
200 to 1000 kilowatts per month.....7c.
1000 kilowatts or over.....6c.

Minimum charge per month, 50 cents.

A discount of 20 per cent. is given on all bills paid before the 10th of the month.

Personally I do not favor these rates. There is too much difference between the cost to the small and to the large consumer. And the discount is too great. It makes it possible for the largest consumer to get a net rate of 4.8 cents per kilowatt, which in my opinion is entirely too low, and was not demanded. I recommended a rate of 8 cents per kilowatt, with a discount of 7½ per cent. on all bills under $20 and a 15 per cent. discount on all bills over $10 paid before the 10th of the month. This rate was first adopted by the common council, but was afterward changed to the rates given above. This would have given a minimum possible net rate of 6.8 cents which is low enough, even for a municipal plant. The gross earnings of the plant for the month of December, 190?, the fifth month since the city assumed charge of the plant, was $2,711. In this the city of Richmond is charged with seventy-four street lights at $7,500 per annum. This plan of charging the city a fixed price for service is to be followed in order to place the plant on a business basis. The pay-roll of the employes, including superintendent and all help, is at present $753 per month. The superintendent receives a salary of $1,500 per year. At the central station are two engineers at $55 per month each, two firemen at $60 each, and one helper at $30. In addition to this there are one lamp trimmer, four linemen and an office clerk employed at the present time.

The Indiana general assembly in 1891 enacted a law providing for a commission of three members to construct and operate municipal water works or electric lighting plants in cities having a population of 10,000 or more and not operating under a special charter; this commission to be appointed by the common council of any such city owning a municipal lighting plant or contemplating the construction of one, at its first regular meeting in June of any year. But this plant being under construction before the enactment of this statute, the commission appointed did not assume charge of the operation of this plant until after its completion and acceptance by the council. The commissioners are George R. Williams, president; P. A. Reid, secretary, and Joseph S. Zeller, treasurer, men inexperienced previous to their appointment in the operation of lighting and power plants, but all substantial and successful business men, and it is believed they will make the plant a success.

BOILER ROOM, ELECTRIC LIGHT PLANT, RICHMOND, IND.

I am of the opinion that this plan of placing a municipal plant of this kind in charge of such a commission, is a very great improvement over the old way of

leaving the construction and operation in the hands of the common council, and I believe it will overcome some of the objections which have been made to municipal ownership.

A Brief Description of the Construction of the Indianapolis, Shelbyville & Southeastern Electric Railway.

By R. P. Woods, Indianapolis.

The three-phase system is used. A low voltage generator is iustalled in the main power house at Shelbyville, and the change to the higher voltage is produced by passing the current through the static transformers; from there it is conveyed on high tension wires to the transformers in the substation and there stepped down to 650 volts and passed through the rotary converter to the feed wires. This substation building is located about eighteen miles from the power house.

In cities and towns the track is in the center of the highways. The seven miles out from Indianapolis is parallel with and thirty-six feet from the center of the Michigan state road. The remainder of the line is on private right of way and in general parallels the Cincinnati division of the Big Four railway.

From the corporation limit of Indianapolis to that of Shelbyville the maximum curvature is a twenty-degree curve, thus allowing the use of locomotives and ballast cars during the construction of practically the entire line.

All turnouts are 500 feet in length, each end provided with No. 10 spring frog and spring switch, with a lead of 82½ feet; standard railway ties, 6x8x8, were used, those on the bridges being ten feet in length.

Six inches of gravel ballast was placed under the ties and filled in flush with the top in the center of the track. The gravel was taken out of a favorable deposit near the town of Fairland with a steam shovel, and distributed by aid of locomotives and Roger ballast cars and plow cars. The rails are 60 pounds per yard, A. S. C. E. section, with four-bolt angle bars; also nutlocks and figure "8" copper bonds. Copper crossbonds connect the rails every 800 feet. There are 950 lineal feet of steel bridges, varying from 30 to 200 foot spans; 300 feet of wood span bridges and trestles and over 3,500 cubic yards of stone masonry in bridges. The "Y's" were placed at favorable places on the line to facilitate the running of the cars.

Poles were spaced 100 feet apart on straight track and closer on curves. Single pole bracket construction is used, except in cities and towns and on sharp curves, when cross suspension is substituted. The high tension current of 20,000 volts is carried on three No. 4 wires, one placed on top of the pole and one on either side of the wooden cross-arms, and all so located that each wire is twenty-four inches distant from the other two. No iron braces are used to support the cross-arms, and heavy porcelain insulators are used, the intention being to diminish the loss of current as much as possible. The feed wire is a 400,000 circular mill insulated copper wire and is placed on a glass insulator on an iron bracket, close to the pole. It is tapped every 1,000 feet to feed the direct current to the trolley wires. The latter are two 00 figure 8 trolley wires, bridged frequently. Two No. 12 wires are attached to the poles near the cross-arms, and are used for telephone service, connections being provided every 1,200 feet.

The power house, car barns and substation are each built of brick. The power house is 76x94 feet, with a middle brick wall separating the engine-room from the boiler-room. At the rear of the boiler-room is a large coal bin, with an elevated track and trestle leading to it, thus allowing coal cars to be taken into the building. This is a special device for center-dump coal cars. In the engine-room is an 800 h. p. cross compound condensing engine, made by the Atlas Engine Works, Indianapolis, and a 600 K. W. low-voltage generator, direct connected. There are also a three-panel switchboard, three static transformers, lighting arresters and an Ide exciter engine, a 300 K. W. rotary converter and a Wheeler condenser. A current of 650 volts, as produced from the generator is, on the one hand, as stated above, sent to the transformers and from there to the high-tension wires, which carry it to the sub-station; on the other hand, the low voltage, as produced directly from the generator, is taken through the rotary converter and from there passed out, as direct current, to the feed wires. This same duty is also performed by the rotary converter in the sub-station. In the boiler-room are two Stirling water tube boilers, each boiler having two batteries; the total representing 800 H. P. There are also two Dean feed pumps in this room. The whole building is so arranged that a duplicate of all machinery can be laid at any time. The water supply consists of a dug well eighteen feet in diameter and twenty feet deep.

The car barn is seventy-six feet wide and 176 feet in length, having a capacity of eighteen cars. Repair pits are provided for taking care of the motors. The cars are forty-six feet in length, with a seating capacity of forty-eight; the weight is about twenty-two tons. Each car is provided with Peckham double

trucks, 4-50 H. P. Lorain Steel Company motors, Christensen air brakes, Smith hot water heaters, Lorain controller and Ohmer car register.

The equipment in the sub-station consists of a 300 K. W. rotary converter, three static transformers, three-panel switchboard and lightning arresters.

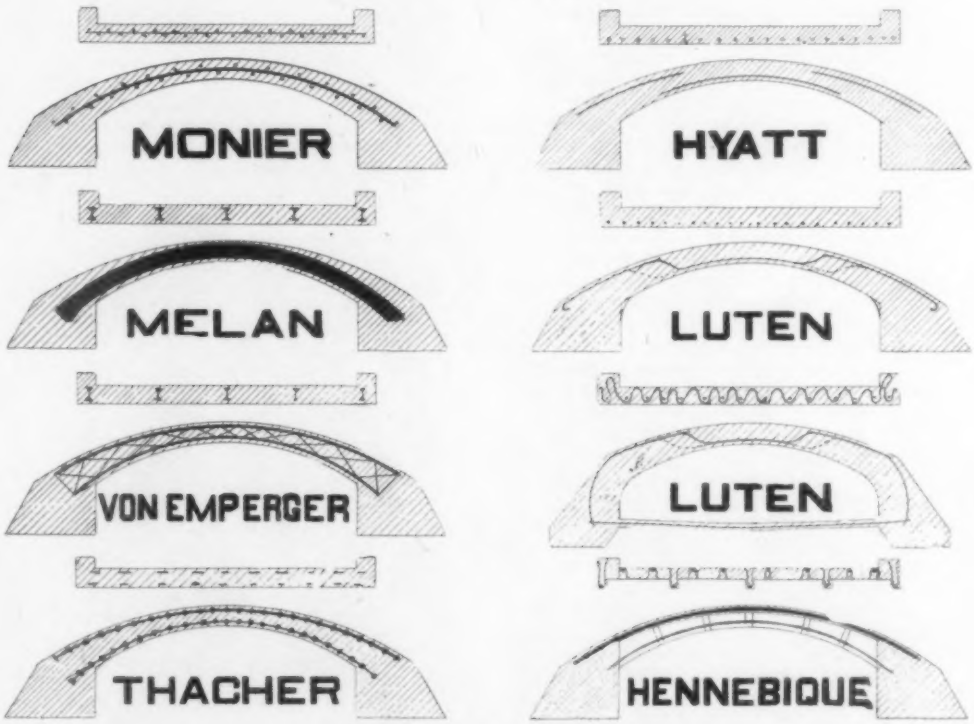
Concrete-Steel Arch Bridges.

By Daniel B. Luten, Indianapolis.

Several different types of concrete-steel arches have become more or less popular in this country and as all concrete steel arches are protected by patent, a short description of each of the different types may be of value. The history of concrete-steel arch construction in the United States may be said to date from 1897 when the Topeka bridge at Topeka, Kas., was built, a Melan arch bridge of five spans varying from 90 to 125 feet each. In France and Germany concrete-steel construction began at a much earlier date, and many bridges of considerable span were erected in the early nineties.

The first of the concrete-steel combinations to gain popularity abroad was the Monier type, which consists of a mesh work of longitudinal and transverse rods of steel, usually placed near the center line of the arch rib. This type of construction rests on the theory that the steel rods will resist the compressive stresses of the rib, while the concrete acts merely as a stiffener to prevent the steel from buckling.

The Melan arch was patented in the United States in 1893, and consists of steel ribs embedded in the concrete of the arch, and extending from abutment to abutment. The ribs are in the form of steel I-beams curved to follow the center line of the arch rib. The steel is usually assumed to be sufficient to resist the bending moments of the arch while the concrete is relied upon to resist the thrust and to act as a protective coating for the steel.



TYPES OF CONCRETE STEEL ARCHES.

The Von Emperger arch is a modification of the Melan arch, in which the ribs are built up with angles for the flanges and diagonal lacing to replace the web, on the theory that the metal should be concentrated near the extrados and intrados of the arch to more effectually resist the bending moments.

In the Thacher arch this idea is carried still further by omitting the web entirely, and reinforcing the concrete steel bars in pairs one above the other,

the former near the extrados, the latter near the intrados, the steel being relied upon to resist the bending moments while the concrete is expected to resist the thrust in the arch.

On the theory that it is good economy to reinforce concrete with steel in tension, but is uneconomical and indeed worse than useless to reinforce concrete with steel in compression, (on account of the danger of rupturing the concrete by buckling under compression) the Hyatt arch omits that portion of the steel bars or rods that would in the Thacher arch be subjected to the greatest compression. That is, the tension regions of the arch rib are reinforced by rods intended to pass through the tension regions only, and not continued beyond these regions.

In the arch designed by the writer the concrete rib is reinforced by tension members passing from one side of the arch rib to the other, and as far as possible through the portions in tension, that is near the intrados at the crown and near the extrados at the haunches. This device admits ready combination with a tie from abutment to abutment beneath the bed of the stream, to resist the horizontal thrust on the abutments.

In the Hennebique system of construction an arch barrel or drum, usually four to six inches thick, is supported by ribs of concrete below, the concrete of the drum being reinforced with steel rods placed near the extrados, and that of the ribs by steel rods near the intrados, with U-shaped bars extending from the rods across the concrete ribs. This latter system of construction has become extremely popular in France.

In addition to the above types of concrete-steel arches, there are numerous forms of steel shapes advocated for reinforcement of concrete arches, such for example as expanded metal, lock woven steel, Ransome twisted bars and corrugated bars, but they are types only of reinforcing steel, and are applied to arch construction under one of the seven types given above. There is also the Cheney concrete bridge which consists of a reinforced spandrel rather than a reinforced arch.

A Few Applications of Concrete Steel in Building.

By H. C. Brubaker, Indianapolis.

I will describe a few of the applications of concrete-steel to building construction which were made in connection with the construction of the Merchants' Heat and Light Company's power house in this city. In the installation of a battery of five Wicks boilers, a tunnel was built under the ash pits, with a view of installing a system of ash-handling machinery at a later date. For the present, the ashpits must have a floor which can be removed conveniently and without injury to the rest of the structure when the machinery is installed.

For a number of reasons a brick arch was not practical; therefore, concrete steel construction was resorted to, as follows: The walls of the tunnel were built up square to the hight of the required floor. A flat center was then built between the walls at this hight, of seven-eighths-inch pine boards, supported by two by fours. On this was laid a wire netting of No. 16 wire and two-inch mesh. The netting was the full width of the tunnel and extended the entire length of the setting. Five inches of concrete, made of 1 to 5 of Portland cement and clean gravel, respectively, was laid on this center, part of it being rammed through the wire netting, in order that one inch of the concrete should be below the netting. The concrete rested on the tunnel walls, on each side, about four inches. This work was done in a very short time, practically less than one day, and on the day following the brick work for the settings was commenced. The tunnel was seven feet wide and about seventy-five feet long. When the ash-handling machinery is installed, as much of the floor as is necessary can be cut out and the balance will support itself, the operation not disturbing or injuring the structure.

The cement, lumber and labor, in fact, all of the materials necessary, with the exception of the wire netting, were on hand, and the wire netting was secured out of stock at the hardware store. Scaffolding lumber was used for the centers, which was taken out later and used again for the same purpose at another place.

A similar floor was constructed over the smoke tunnel behind the boilers; however, this floor is of more importance, and it must necessarily be stronger and permanent. It has also to support an uncertain live load, besides the boiler feed pumps, and would be exposed to the heat and gases from the boilers. Those who are familiar with the Wicks boiler settings, know how the breeching comes out behind the boilers at the floor level; in this case, it turns down into the tunnel, in a manner which makes it particularly awkward for the construction of a floor, by any method other than that resorted to. Each breeching is about 4 feet wide, and for this distance offers no support for the floor, save the ¾ inch angle iron used as a stiffener to the breeching. The concrete steel floor fitted the purpose admirably; in fact, it would have been a serious problem to suspend

any other kind of a floor. In this case, as in the case before described, a flat center was built with the surface 6 inches below the finished floor line. The tunnel was 7 feet wide, and the concrete 6 inches thick, including the finish top. A wire netting of the same size and mesh was imbedded as before described, the concrete resting on projections of the brick work on each side of the tunnel.

A suspended engine room floor is always more or less of an inconvenience to construct, on account of its irregularity. The foundations of the engines and the pipes, etc., coming through the floor made a regular system impossible. In the case of the engine room of the power house above referred to a 4-in. projection of brick work was built out from all walls and foundations at a level 6 in. below the finished floor, to form a support for the floor. Several sections of the floor were not more than 4 ft. wide. These sections were put in without any reinforcement of the concrete. The engine room is 30 ft. wide by 90 ft. long. The floor was divided into three panels, each being 10 ft. wide and the full length of the room. Two rows of I-beams were built in parallel with the length of the room, spanning the open space between the end walls and the engine foundations. These I-beams were 10 feet on centers and divided the width into three panels, as before described. The open space between the foundations was very irregular, and only required one row of beams. This row divided the width in most cases, making the panels from 7 to 9 feet wide. A flat center was built, as in the other cases, under the entire floor, with its surface 6 inches below the finished floor line. The lower flanges of the I-beams were left clear to furnish a support for the concrete, three-eighths inch by one and one-fourth-inch steel straps were laid across the panels eighteen inches on centers, resting on the ledge of brick work at the walls or foundations and turned up and over like a bracket and bent over the upper flanges of the I-beams. These straps were bent down between the support within 1 inch of the center, so that they would come in the lower section of the concrete and below the neutral axis. Six inches of concrete were then laid on these centers in the ordinary manner with a half-inch finish on top, and marked off in oblong squares in line with the centers of the I-beams. The panel next to the wall was the full length of the room, and in most places 10 feet wide. The other panels were smaller and irregular. The concrete was made, as above described, with 1 to 5 of Portland cement and clean gravel. The centers were removed after three days, and since then heavy machinery has been moved back and forth over the floor, without the least injury or sign of distress.

Neither of these methods of construction is covered by patents, and therefore, no royalties had to be paid. The gravel was secured from the company's street excavations near by. The floor cost approximately twenty-five cents a square foot, including the centers, steel straps and the steel beams. Where the steel beams are not to be taken into account, the floor can be estimated sufficiently at from eighteen cents to twenty cents. It would have been an improvement, if we had used clean cinders in the place of the gravel, as we have done in other cases. The floor in that case would have been much lighter, but not necessarily any stronger. The gravel was used as it was on hand, and cost nothing.

MUNICIPAL GOVERNMENT.

Police—New Charters—Finances—Improvements in Oneida and Houston.

Prompt Action by New York's New Police Commissioner.

Within an hour after he assumed command of the New York police department, Jan. 1, Gen. Francis V. Greene suspended all inspectors and captains now under charges, as he does not believe it has a good moral effect to have men under a cloud remaining in command. He announced that the changes were made to improve the efficiency of the force. Gen. Greene succeeds Col. John N. Partridge as commissioner.

Steps Toward New Charter for Grand Rapids, Mich.

A report, outlining the creation of a special commission for forming a new charter for the city of Grand Rapids, Mich., was submitted to the common council, Jan. 12, by the committee on charter amendments. The report pro-

vides that the city attorney be directed to prepare an act providing for the creation of a charter commission, said act to be submitted to the present legislature for adoption. Said act provides that the mayor of the city within thirty days shall appoint the commission which shall be composed of twenty-five representative citizens selected without reference to party affiliations, and representing as nearly as possible all professions, trades and business interests of the city; that it will be the duty of said commission to make an exhaustive study of our present charter, our municipal needs, and also of the best types of city charters now in operation in other cities, and draft a bill for an act to incorporate the city of Grand Rapids and to provide a charter therefor; to repeal all laws in conflict therewith and for submitting said bills so prepared to the qualified electors of said city for approval; for submitting said bill, if so approved by said electors to the legislature of the state of Michigan for adoption or rejection as a whole, and for the payment of the expenses of said commission, it being understood that said commission shall serve without salaries.

Provisions of Proposed Charter for Fergus Falls.

The charter commission appointed by Judge Baxter to frame a new charter for the city of Fergus Falls, Minn., submitted its report to Mayor McMahon Dec. 27. Radical changes are provided for in several instances. The city limits are extended so as to take in the electric light plant; the city is given jurisdiction for a mile beyond its limits in order to control nuisances; city elections are to be held every two years instead of every year, as at present; the term of the mayor is to be increased to two years, and of aldermen to four years; one new office is to be created, the officer to be known as the auditor or controller; a park commission is to be created and provision made whereby the city will obtain a revenue from franchises; the management of the city electric light plant is to be taken from the direct supervision of the council and placed in the hands of a commission, and the water works when acquired will be placed in the hands of the same commission. The council will call a special election to vote on the adoption of the proposed charter.

Bloomfield, N. J., Finances.

In a report submitted by the finance committee Jan. 5, the financial condition of the town of Bloomfield, N. J., was shown to be better than at any time since its incorporation, three years ago. The cost of the sewerage system was $282,800, and of this amount $173,300 has been paid. The school debt in March, 1900, was $158,000, of which $9,000 has been paid, leaving a balance of $149,000. The floating debt is $32,000 and street improvement bonds to the amount of $75,000 exist, but are not payable until June 1, 1919. The total indebtedness of the town is $378,397.14, a decrease in three years of $177,402.86. The highest point of indebtedness was reached just before the town was incorporated, when the assessed valuation was $3,700,000. A steady reduction in the debt and an increase in valuation, which is now $5,050,000 has since been brought about.

Mayor of Worcester Refuses Increase of Salary.

Hon. Edward F. Fletcher, mayor of Worcester, Mass., has vetoed an order increasing his own salary from $2,500 to $4,000. He holds that no city can be made attractive which has not an attractive tax rate, and that taxes can not be kept down when those responsible add unnecessarily to them; that the performance of public duty is not a matter of dollars and cents and that the salary of the office of mayor should not be large enough to be tempting as a money prize.

Public Work in Oneida, N. Y.

The report of Wellington R. Vedder, city engineer at Oneida, N. Y., shows that during the nine months that he has been at the head of the department improvements have been made involving expenditures of $170,526.90. The pavements under contract will cost $118,566.90, the sewers $45,847.35, the water mains extension $2,840, the culvert in Main-st., $975.50 and the storm sewers contemplated about $1,200. The city's share of rebuilding the bridge across Oneida creek near Kenwood is $1,100. Mr. Vedder said that he was unable to find any profiles or maps of several lines of sewer built before he became city engineer, and reports that to secure a complete record of the lines in question will necessitate considerable time and labor. He recommends that all the sewers be plotted in books made for the purpose. He has made street profiles approximating 41½ miles since assuming office, given grades for 1 66-100 miles of sidewalk, made surveys, plans and estimates for extending the water mains 81-100 miles, prepared plans for 2½ miles of storm sewers, and plans and specifications for sanitary sewers now being built in certain streets.

Houston, Tex., Improvements.

The annual report of City Engineer F. L. Dormant of Houston, Tex., which has been submitted to Mayor Holt, sets forth in detail all the workings of each department.

After classification of the different sewers of the city, Mr. Dormant says:

The intercepting sewer collects the discharge from the different districts and conveys it across the Buffalo and White Oak bayous into the receiving basin at the pumping station and from there it is pumped through a twenty-four-inch force main to the disposal grounds, some two miles outside of the city limits. There are 138 catch basins connected with sewers, discharging storm water, street refuse, sand and other matters into the sewers, and with the present arrangement there are usually stoppages and overflows in the case of even light rains.

It is a well-known fact that the city of Houston has outgrown its present system of sewers, and that some of the best portions of the city are without sanitary sewerage at all. This office is now engaged in designing systems on the separate plan for each ward and care will be taken to provide for sizes and grades commensurate for the future extension of the city limits, so that any new territory which may be acquired will have the benefit of sanitary sewerage.

The city of Houston has never had any systematized drainage scheme. Located along a water front, it has every facility for getting rid of its surface water. Instead of this a large portion of it is drained in a direction away from the bayou, contrary to the laws of nature.

On my taking charge of the sewer department, neither the pumping station nor the disposal plant was in operation. An examination of the receiving basin at the end of the intercepting sewer disclosed the fact that the basin was filled up to the top with debris. A similar examination of the siphons showed both of them to be clogged up from end to end.

A similar condition of affairs existed at the pumping plant. After constructing and placing screens in receiving basins at Milam and Commerce-sts., and at the beginning of the White Oak bayou siphons, cleaning and recaulking every joint thereof, and the construction of relief valves, etc., I finally succeeded in putting this part of the plant in operation on the 22d day of May, 1902, after an expenditure of $1,300, and it has been in operation ever since. An examination of the force main to the filter beds has disclosed numerous leaky joints owing to bad workmanship in the laying of the pipe, and where so discovered they have been repaired.

The purification plant consists, first, of an elevated "coke strainer" so-called in the specification, and second, of sand filters. The coke strainers consist of eight inches of coke on six inches of broken stone, underdrained by vitrified pipe, the joints of which are wrapped with muslin. The sand filters consist of two and one-half feet of sand underdrained by four-inch tile pipe. The force main consists of 4.76 miles of twenty-four-inch cast iron pipe.

The sewage after being discharged by the siphons into the receiving basin at the pumping plant is pumped to the purification plant by means of centrifugal pumps. The fluid, after passing through the coke beds, flows thence over the sand beds and passes off through tiling laid in the bottom of these beds.

The majority of the pipes both in the coke beds and the sand beds will have to be replaced on account of bad workmanship during construction. Hundreds of holes have appeared in the sand beds, indicating that the sand is being washed away into the pipes. Two of the sand beds will have to be reconstructed. The pipes carrying the sewage to the sand beds are also leaking badly and need relaying. On account of the absence of a detritus tank or settling reservoir the coke beds are being clogged up badly, causing additional expense in cleaning. The brick dwelling house on the grounds has never been finished, the roof leaks badly and the chimney was omitted entirely.

The object of the scavenger disposal plant is to dispose of the night soil as collected by dumping it into a receptacle connected with the receiving basin at the sewage pumping station, where it drops near the suction of the large centrifugal pump, which is capable of handling 4,000 gallons per minute. It will save the city thousands of dollars each year and will practically dispense with the dumping grounds. It has been constructed of bricks from the old market house, has an internal diameter of twenty feet, flushing arrangements, and also an arrangement for washing the barrels after they have been emptied. The plant is now ready for operation.

Among his recommendations are the following:

A revision of the present plumbing ordinance.

The establishment of the grades of each street in the city, profile to be adopted by the city council and filed with the city secretary, thus enabling property-holders who wish to put in permanent sidewalks to have the curbing set at a permanent elevation, which will remain if the street should afterward be paved.

To put in sanitary sewers in all streets prior to paving same, and run connections up to curb line on both sides of the street.

A rigid separation of sanitary sewers from storm sewers.

The establishment of a standard distance between curb lines on streets of each given width.

The construction of detritus tanks at the disposal plant, to separate the insoluble matter in the sewage which cannot be liquefied, so as to prevent the silting of the beds.

That no more streets shall be paved without first putting in storm sewers and until the drainage survey now in progress shall have been completed.

I recommend that the city purchase a steam roller of ten tons weight. This would be very useful, as there are repairs always being made to our pavements where a roller is an absolute necessity, and for future gravel pavements such a machine would also prove to be a source of income to the city when not being used by city, as it could be rented out.

I recommend that the city purchase a ditching machine for use in digging and cleaning ditches. These are now dug by hand labor and a machine, besides doing the work quicker, would save enough to the city in one year to pay for itself.

The first asphalt pavement was laid in Houston. On Willow and Liberty-sts., in 1897. This pavement has not been a success, owing to its having been laid in the winter time. It is in a bad condition, especially on Willow-st, where there is an enormous traffic. The pavement on Liberty street is not so bad, though it is cracked from one end to the other.

Besides the mistake of laying asphalt in the winter time, there are other causes for the failure of asphalt pavements, such as the expansion of the concrete base, as evidenced on Main-st., near Walker. An excess of asphaltine also makes a pavement hard and liable to crack and disintegrate. Present experience indicates that the life of a street paved with asphalt under ordinary traffic is from twelve to fifteen years before relaying, and should cost not more than 6 cents per yard per year for maintenance after a five-year guarantee.

It is best to award a contract to responsible parties to keep a certain number of streets in repair for a term of five years at a specified price per year for material in bulk, including all streets of which the guarantee expires during the contract period. By this plan it would be for the contractor's interest to keep the street in good condition at all times.

Defects in pavements in this city during maintenance are being caused by (1) standing traffic; (2) imperfect drainage causing water to stand in gutters by piling street sweepings against the gutter and by water standing in depressions; (3) fire burns; (4) escapement of illuminating gas; (5) oil drippings from kerosene wagons; (6) center bearing and side bearing rails and toothing stones; (7) constant moisture and disintegration if excessively sprinkled.

Repairs on asphalt pavements should be made as soon as discovered on account of the material having little coherence and if put off, the breaks or holes rapidly assume larger dimensions by passing wheels and other traffic. During bad weather no repairs should be allowed on asphalt pavements, and patches made during winter ought to be considered only as temporary and should be replaced in the spring.

The first brick pavement in Houston was laid in 1894 on Texas-ave. Since then rapid strides have been made in the manufacture of paving bricks, and today we have a brick which is thoroughly burned and annealed.

Some of the defects in our earlier brick pavements are caused by the lack of uniformity in the quality of the brick, some bricks being soft and porous. A rigid inspection of the brick before using could have obviated this.

The long time guarantee called for in asphalt pavements is unnecessary in brick pavements, but I would recommend a nine-months' guarantee for this class of pavements in all future contracts.

Civic Progress.

The January number of The Chatauquan devotes some space to the recent movements to improve city conditions. Mr. George C. Sikes tells how the Chicago city council was regenerated in the years following 1895. J. Horace McFarland tells of the Harrisburg achievement in conceiving, authorizing, financing and beginning the execution of a comprehensive plan of municipal improvement within about eighteen months. Mrs. Louis Marion McCall gives a graphic description of the campaign of the St. Louis Civic Improvement league for "Making St. Louis a Better Place to Live In," in preparation for the World's Fair, which she considers a blessing if only because it affords a reason why the city should be put into the best possible shape. This month's number is well worth the perusal of all interested in municipal betterment.

WATER SUPPLY.

Municipal Ownership—Meters—Finances—Exhibits—Salt Water Fire System—New Toledo System—Measurement of Flow.

Bill Providing Municipal Ownership of Water Works in Indiana.

A bill has been introduced in the Indiana Legislature which provides that cities under 45,000 population may create a sinking fund by levying a tax of not more than 50 cents on each $100 for the purpose of constructing water works, providing a majority of the voters declare in favor of it. The fund shall be under control of a special committee of three appointed by the common council, which shall invest it in United States, state, county or city bonds, or first mortgage on realty. When the fund shall have reached the required amount it may be applied to the purchase of water works, provided that within one month after formal notice by the council, one hundred freeholders may successfully petition for another election to decide whether the voters are still desirous of making the purchase. In case there is a change in the decision, the accumulated fund shall revert into the general city fund.

Proposed Reduction of Water Rates in Rochester, N. Y.

In a report submitted to Mayor Rodenbeck of Rochester, N. Y., Jan. 15, E. A. Fisher, city engineer, says of the result of his investigation of the municipal water supply and his opinions regarding the proposition to reduce the water rates to manufacturers, the following:

The rates charged for water in this city are of two classes. The first is what is known as the "flat" rate; that is, a definite sum per year for certain classes of supply; and, second, a rate of 14 cents per 1,000 gallons for all water used from the domestic system, through meters. In the latter case the minimum rate paid by any person must be not less than $5. The river water is furnished at the rate of 10 cents per thousand gallons, and is comparatively little used on account of its poor quality and the limited capacity of the works.

He says that the average rate charged for water for ordinary dwellings is from $8 to $9, which, compared with other cities, is low. Only seven out of thirty cities have a lesser rate. Mr. Fisher also says that the request for a reduction of rates comes from manufacturers, who urge that a rate of 14 cents per 1,000 gallons is much larger than the rates in other cities. He states that the average minimum rate for water for manufacturing purposes in thirty other cities is 7.62 cents per 1,000 gallons, thus establishing the truth of the local manufacturers' claim.

Mr. Fisher reviews in detail the capacity of the local water systems and the improvements which will probably be made soon. He says that a possible increase in consumption because of a reduction in rates could be checked by the general introduction of meters. He also thinks that the consumers should pay for the meters. In conclusion he says:

Our minimum annual meter rate of $5 is very much lower than the average of other cities, as is also the meter rate of 14 cents per 1,000 gallons for small consumers. There is, therefore, no justification for a reduction of these rates. In the case of manufacturers using large quantities of water the conditions are different. Our rate is much higher than in most other cities, and it may be advisable as good business policy to reduce the rates for water used in excess of a given amount, say 100,000 cubic feet per year, costing $105. All consumers then would pay at the same rate as at present for water used up to the amount of 100,000 cubic feet per year, the reduction applying only on the excess.

In making a reduction the fact should be borne in mind that the domestic water of this city is of a better quality than that generally used in other cities, and that the cost, owing to the large amount of capital invested in the construction of the works, is more than that of many other cities.

Salt Lake City Water Works Management.

In his annual report for the year 1902, Frank L. Hines, city superintendent of water works at Salt Lake City, Utah, states that the total expenditures of the water works department during the year amounted to $45,150.50. The preceding year the expenditures were $42,144.30. Of the above amount $23,200.66 was expended for maintaining the system, which is an increase of $3,200.66 on the year 1901. The increase is due to the large number of services, there having been 792 new connections made during the year, which is the largest number since the year 1892. The cost of the new services during the year was $10,619.20 and of the improvements to the plant, $1,930 71. Work performed and material furnished to several of the city departments amounted to $258.91; for individuals and companies,

$2,204.38; miscellaneous items on special accounts, $4.189.66. During the year 70,038 feet of water mains were laid, which makes a total of 153 miles of water mains in the city. Mr. Hines says that the placing of meters was the means of preventing a great waste of water during the famine of the last season. The total number of water meters in use during the year was 228.

Water Waste in Cincinnati.

The annual report of William E. Boeh, superintendent of water works at Cincinnati, O., which will be made public the latter part of February, will show, according to local press reports, that nearly 8,000,000 gallons of water are wasted annually in that city and vicinity to persons supplied with city water. Superintendent Boeh says "the figures mean, more than anything else, that it will not be long before everybody in Cincinnati will buy water by meter. Probably everybody will be put on meter when the new water works are finished. The water will be clearer then than it is now, and for that reason a smaller meter will be used. Only 10 per cent. of the city's present patrons now have meters in. As closely as we can figure now, the average amount used in 1902, per capita, was 130 gallons. This is just twice as much as ought to be used, and probably more. I think probably sixty gallons per day would be plenty. But at least half of the water pumped is wasted."

He says the waste of water is more pronounced in summer time than in winter. The capacity of the present pumping stations is 80,000,000 gallons daily, and many times in the summer they pump up to their capacity.

Exhibit of Water Works System at St. Louis Exposition.

The board of supervisors of San Bernardino, Cal., have consented to an appropriation of $350 to be used in the construction of a miniature exhibit of the water works system of the town of Ontario, Cal., which will be placed on exhibition at the St. Louis fair.

Finances of Syracuse, N. Y., Water Works.

In a report filled Jan. 5, Thomas F. DeLang, superintendent of the bureau of water, at Syracuse, N. Y., shows that the total expenses of the operating department for the year were $230,578.66 or $3,831.34 less than the appropriation of $234,410 made in the budget. The net receipts of the operating department were $265,707.07. The excess of receipts over expenses not considering the balance on hand at the beginning of the year was $35,128.41.

Salt Water Fire System Recommended for San Francisco.

In his annual message to the board of supervisors Jan. 12, Mayor Schmitz recommended the installation of a salt water system for fires, and the use of bituminous macadam in place of smooth asphalt.

Report on Extension of Toledo's Water Supply.

The long and comprehensive report of the engineer commission which has been studying the question of extending and improving the water supply of Toledo, O., was published Jan. 7. The commission consisted of G. H. Benzenberg of Milwaukee, Allen Hazen of New York and William G. Clark of Toledo.

After considering in detail the various propositions which have been made from the sanitary and manufacturing standpoints and making detailed estimates of cost, the report sums up the results of its labors, rejecting ground water sources of supply as insufficient in volume and in some cases requiring special treatment, the only good source being out of reach on account of excessive cost; setting aside supplies from Lake Erie according to two plans and from Swan creek after comparison with the present source of supply, the Maumee river direct, or the river through the Miami & Erie canal on grounds or much greater first cost, expense of operation or danger from contamination.

The recommendations of the commission are as follows:

Upon a careful consideration of all questions upon the proposed improved water supply for this city, your commission recommends that the Maumee river be continued as the source of supply, that the water be taken from the main channel in the river opposite the Country club.

We further recommend that upon appropriate sites a low lift pumping station and a suitable purification plant with clear water reservoir suitably equipped and in conformity with the requirements as set forth in the above report as necessary for the fifteen or twenty years, be erected and properly connected with each other and the main pumping station as soon as possible. These works can thereafter be enlarged as the increased consumption may make it necessary, and the entire works should be designed in a comprehensive manner so as to permit such extension without causing any disarrangements of any of its existing parts.

We further recommend that if at any time it should become possible for the city to secure the right to use water from the Miami & Erie canal for a period of years, in quantity sufficient to supply the consumption, a suitable connection should be made between the canal and the coagulation basins, and that the supply be taken from the canal, and that the necessary betterments along the canal as indicated in our report be made. The reduction in cost of operation will amount to about two dollars per million gallons drawn in this way.

We further recommend that such puri-

fication plant be thereupon placed in charge of a competent and experienced person to operate it, and we are satisfied that the purified Maumee river water will prove to be an ample supply of pure and wholesome water.

The cost of the Lake Erie scheme, using the present pumping plant, is estimated at $2,865,654; for a plant sufficient for 15 years, $2,173,754; the cost of the plant utilizing the water from the lake and building a new pumping station at Ironville would be $3,121,923, and for a plant to last 15 or 20 years without additions, $2,052,723. The cost to put the Swan creek plan in operation is estimated at $2,398,660, or $1,953,160 for a "1920" plant.

The estimated cost of making the improvements necessary for establishing the system recommended is $773,190 for a plant to meet the conditions until 1920; to meet the conditions anticipated for forty years hence the estimated cost is $1,204,390.

The estimated annual cost for the operation of this plant, as recommended, including the cost of preliminary pumping, operation of purification works and allowance for interest and sinking fund charges, would be in 1904, $64,670; in 1910, $77,554; in 1920, $97,000; in 1930, $129,123; in 1940, $160,371.

Work in Progress in Measurement of Streams.

The United States Geological Survey is making a special study of the flow of streams in the Mississippi valley through M. O. Leighton, the hydrographer in charge of this district. Observations are now being made upon gauges showing hight of water in several streams, as a basis for computing their maximum average and minimum discharges. Some of these are being studied with reference to their possibilities as sources of water power and some as water supplies, both with reference to quantity of supply and percentage of pollution.

Gauges are located on the Meramec river, three on its headwaters, with reference to its use as a water supply and one opposite St. Louis in connection with a water power project. Black creek, running into Lake Erie in Ohio, Cross creek at Steubenville and McMahan's creek at Bellaire, running into the Ohio river in Ohio, each has a gauge, the streams being possible sources of water supply. The Cuyahoga river at Cleveland, O., is being measured with special reference to the question of dilution of Cleveland's sewage. The streams at Zanesville, O., have gauges as possible water supplies. Three gauges at Defiance, O., on three streams, are to determine their possibilities for both water supply and power. The Little Miami river is under study near Morrow, O., as a source of water power.

STREETS, ROADS AND PAVEMENTS.

Elevated Roads—Grade Crossings—Municipal Ownership of Street Railways—Concrete—Legislation—Oil—Wooden Blocks—Asphalt Trust Controversy—Bituminous Pavement—Brick—Detroit Lighting Experience.

Grand Jury Recommends Municipal Ownership of Elevated Railroads in Brooklyn.

In a presentment handed down by the grand jury of Kings county, New York, Dec. 31, on surface and elevated railroad facilities in Brooklyn, it is recommended that the Brooklyn Rapid Transit Company make certain changes in its system with a view to the improvement of existing conditions. Also that the attorney-general take steps to annul the charters of the constituent companies of the company. The grand jury suggests to the court and citizens in general that municipal ownership and operation of public transportation facilities is the only solution of the question of city transit; that in its opinion, under public ownership, the city railways could be operated on a three-cent fare basis and still leave a large net surplus.

Grade Crossings in Columbus, O.

The abolishment of grade crossings on the west and south sides of Columbus, O., is provided for in an ordinance introduced Jan. 12, which has for its ultimate object the elevation of the railroad tracks in these sections of the city. The proposed plans have the approval of the board of public works. The discovery has been made that by a new law passed

May 2, 1902, the city has authority to issue bonds sufficient to separate streets and railroad grades; that the city and the railroad companies shall share the cost and expenses equally; that any street railway benefited by abandoning grade crossings may be required to share with the city equally, the cost of the separation to be paid by them.

Bill Providing for Municipal Ownership of Street Railways.

Municipal ownership of street railways is provided for in a bill approved by the city council of Chicago, Jan. 19, and ready for passage by the legislature. The bill gives every city in the state the right to own and operate street railways, and to acquire by purchase or condemnation any existing lines. A clause must be inserted in any ordinance for street railways given to any person or company, reserving the right to the city to purchase the plant. The city council is given the power to license its own cars or lease its tracks to any company for a maximum period of twenty years.

Mayor of Los Angeles Defends City's Right to Streets.

Mayor Snyder of Los Angeles, Cal., has instructed the chief of police to arrest any and all parties attempting to put down a third rail in the streets of that city. No corporation will be permitted to occupy or use a street, or any portion thereof, for railroad purposes without a legal franchise giving such right.

Cross Breaking Tests of Concrete in Progress.

A new series of tests is being conducted by the Maryland Geological survey for B. F. Fendall, city engineer at Baltimore, to determine the strength of various samples of concrete. The tests are being conducted by A. N. Johnson, highway engineer of the Geological survey, and it is believed that they will prove valuable because of the fact that concrete is fast superseding stone in many of the applications of masonry, particularly for foundations. Mr. Fendall and Mr. Johnson have, according to the Architects' and Builders' Journal, agreed that the best test to apply to the concrete is the crossbreaking of bars of known size. The force required to break a bar is measured and from the data thus furnished the strength of the cement is calculated. The cross-breaking test is thought to be better than crushing, because in the latter method it is difficult to apply the force uniformly and that method is also much more expensive.

Defects in Concrete and Asphalt Bridge Floor.

The concrete and asphaltum floor of the new steel bridge at Waco, Tex., has cracked, owing to the effect of the alternating freezing and thawing weather. The county and city built the bridge jointly at a cost of over $100,000. It was accepted in June, 1902, and has been in constant use ever since its acceptance. The entire bridge is steel except the floor, which is made of concrete four inches thick and finished with a wearing surface of asphaltum two inches thick. The floor rests upon buckle plates securely riveted to the girders and joists. The roadbed, including the sidewalks is forty feet wide. The damage is not sufficient, for the present, to impair the usefulness of the bridge. The county commissioners' court and the city council will order an examination of the bridge, and an official report will hereafter be made on the matter.

Kreodone Wood Block Pavements—A Correction.

On page 56 of the January number of Municipal Engineering is a picture purporting to be of a Kredone pavement on Michigan boulevard, Chicago. In reality it is a view of a similar pavement on Vermont-st. in Indianapolis, a confusion of cuts having occurred.

Proposed Legislation on Street Improvements in Indiana.

The Municipal League of Indiana and the State Street Contractors' Association are interested in a bill to be presented to the Indiana legislature providing for the repeal of both the Barrett and Artman street improvement laws, and the passage of new ones. The title of the bill is "an act to provide for the improvement of streets, alleys, sidewalks and sewers in cities not governed by special charters and for the collections of assessments and costs thereon."

Oiling Streets Proposed for South Orange.

The village board of health of South Orange, N. J., has recommended that the work of oiling the streets be undertaken at the expense of the community and under the supervision of the board of health. The work of filling in and oiling low lands in the town has been successfully done for several years in making warfare on the mosquitoes.

Test of Creosoted Blocks.

A test of the creosoted wood blocks that are being used in the repaving of the Sixteenth-st. viaduct at Milwaukee, Wis., was made Jan. 2, at the city hall. An armful of paving blocks was taken at random from the material being used in the work. The blocks were split open and were found to be thoroughly impregnated with oil. The blocks are being furnished by the Terre Haute Creosoting Company of Terre Haute, Ind.

The Asphalt Trust Controversy.

Nathan Buyr, counsel for Henry Spinks of Newport, Ky., who filed a bill praying that the receivers of the Asphalt trust be compelled to fight the suit brought by the Land Title and Trust Company of Philadelphia for authority to sell all the assets under the agreement entered into December 31, 1900, when the Land Title and Trust Company issued $30,000,000 of gold certificates, appeared in the Circuit Court at Trenton, N. J., Jan. 19, and asked that the receivers be directed to fight the suit on the grounds that there had been no default, inasmuch as the Land Title and Trust Company has $6,000,000 of corporate stock out of which the defaulted interest could have been paid and that the directors had not ordered an assessment upon the stock as they had a perfect right and as it was their duty to do.

Counsel charged that the Land Title and Trust Company misquoted the terms of the agreement with the Asphalt Company of America, signed December 4, 1899, and that a literal rendering of the text of the agreement would have shown that there had been no default upon which to base a legal foreclosure suit. Counsel then asserted that a syndicate was offering $3,000,000 for the $6,000,000 of common stock, despite the fact that there was in existence $14,000,000 of preferred five per cent. stock.

Counsel declared that Mr. Spinks, with his 1,000 shares of common stock, was the only solvent stockholder.

The other side was not represented.

On January 26 the receivers filed their answer to the effect that there is due the Land Title and Trust Company the sum of $2,723,075.44 in defaulted interest, and that there are no other assets conveniently convertible into cash available to pay the debt, and that such has been the case since the receivership was established. The answer denies that the following capitalists were stockholders of the Asphalt Company of America at the time when the capital stock of the National Asphalt Company was transferred to it: Peter A. B. Widener, George D. Widener, William S. Elkins, Sidney T. Tyler, Amzi S. Barber, Avery D. Andrews, Ellis A. Ballard, E. Burgess Warren, William J. Satloard and William H. Crocker.

"The facts are these," declares Receiver Tatnall: "The total outstanding capital stock of the company is 600,000 shares of par value of $10. Of this number 598,852 shrares were transferred to the National Asphalt Company these shares being held by 926 persons. The eleven people named above held among them 160,444 shares of the total of 598,852; 915 other persons held the remaining 438,408 shares.

"The only shares of stock not transferred to the National Asphalt company were 1,148 held by ten persons, the petitioner, Henry C. Spinks, holding 1,000 shares."

Owners of the entire legal interest in certificates of the Asphalt Company of America at the present time are about 2,290 in number. Of that number 1,976 have deposited their holdings under the proposed reorganization plan.

The aggregate amount of the collateral gold certificates of the Asphalt Company of America deposited under the said plan of reorganization is about $28,000,000. Of these deposits the eleven persons named above hold among them only $4,397,700, the remaining certificates being held by 1,965 persons.

Counsel asserted that there was but $27,000 in the hands of the receivers. Judge Kirkpatrick reserved decision.

Bitulithic Paving at Kalamazoo.

The decision of the commission of public improvement of Kalamazoo, Mich., in recommending award of contracts for about 50,000 square yards of bituminous macadam pavement, was only reached after careful consideration and investigation. Bids were received December 27 for various kinds of material for 70,000 square yards of streets, and every known pavement was represented in the bids submitted. On January 26 the commission recommended that Portage and Water streets, both business thoroughfares, be paved with metropolitan brick block and that West, Main and Burdick streets, in the residence district, be paved with Warren Brothers' Bitulithic pavement. The commission in October visited Cambridge, Mass.; Pawtucket, R. I; Brockton, Mass.; Boston, Mass.; Yonkers, N. Y.; Bay City, Mich.; Saginaw, Mich., and Huntington, Ind., to inspect this kind of pavement. J. J. Knight, O. K. Buckhout, A. B. Schied and George S. Pierson compose the commission. The contract was awarded to the Central Bitulithic Paving Co. Lower bids on bituminous macadam were submitted by the Barber Asphalt Paving Co., but the commissioners

deemed it inexpedient to accept their bid on account of the probability of a suit for infringement of the Warren patents.

Fond du Lac Committee Prefers Brick Paving.

A committee of two councilmen and the city engineer of Fond du Lac, Wis., have been investigating the paving materials and report as follows:

We unanimously recommend that the streets be paved with the best quality of vitrified paving block; that the construction in every particular be of the best quality and to conform as nearly as possible to what is known as the Grimes's plan of constructing brick pavements such as we saw in Cleveland, Ohio.

We are of the opinion that a block pavement constructed on the lines we have recommended would last at least twenty-five years with very little repair. We are convinced that an inferior paving material with first-class construction will furnish a better pavement than first-class material with poor construction. But first-class material with perfect construction will furnish an ideal pavement.

We saw in Cleveland, Wade Park avenue, constructed in accordance with the above plan. Aside from the soil it is a counterpart of our Main street, a trifle over 40 feet wide, with two street car tracks. This street has been down six years, paved with vitrified shale block. It is as smooth as a floor, there is no evidence of wear and no chipping of the edges of the block. In rubbing the boot over the pavement in any and all directions you cannot detect any creases between the blocks or any roughness.

Achievements of Detroit Lighting Plant.

Hamilton Carhart, president of the public lighting commission of Detroit, Mich., has made his report for the year to the common council of that city. He says:

Our commission is authorized to do public lighting only. Were we permitted to do commercial work as well, statistics show that we could place an eight-candle-power light in the humblest home at a cost for light of about one-quarter of 1 cent per hour. Were we allowed to do this and charge the going price per K. W. we could light the city for nothing and have a handsome balance in our treasury at the end of each year.

If the citizens of Detroit were fully aware of the delights and comforts they have within their grasp from their public lighting plant I think they would insist that it be allowed to serve them.

In spite of the increased cost of material and increased wages during the past year, the cash cost per arc light per K. W. per hour was the lowest of any year in the life of the commission. Two years ago this commission, acting upon the belief that the same low cost per lamp which has characterized its management could be maintained, at the same time wages to faithful employes increased, developed a system whereby the plant could be enlarged according to modern methods and its efficiency greatly increased.

The report gives the cost of arc lights for the past year at $63.82 each, which was $3.49 less than the cost for 1901.

SANITATION.

Reception in Sewer—Franchises for Sewer Systems—Typhoid Fever from Oysters—Garbage Disposal in Small Towns.

A Reception in a Sewer.

A reception to the Iowa League of Municipalities at its annual meeting in Waterloo next September will be given by Mayor P. J. Martin, who will receive in the Dry Run sewer, now under construction. When completed the sewer will be over one-half mile long and 12 feet in diameter. It is said to be the greatest feat of drainage engineering ever attempted in Iowa. It will be perfectly dry nine months of the year, as its purpose is to conduct the water to the Cedar river from a flat section of West Waterloo during extreme wet weather. The sewer will be completed next summer at an estimated cost of $100,000.

Bill Providing for Grant of Franchises for Sewerage Systems in Indiana.

A bill has been introduced in the Indiana legislature providing that the city council may grant a franchise for the construction of a system of sewers for the city, fixing the terms and rates, and providing for the purchase of the system under certain conditions. The bill is understood to be for the purpose of relieving the condition of certain cities in the

state which are unable to proceed with the construction of systems of sewers on account of the fact that the cities' debt limits have been reached and so they can not pay their share of the cost. It is said that the passage of the bill will result in the early construction of several sewer systems which are badly needed and very difficult, if not impossible, to obtain under present conditions.

No Typhoid Fever from New York Oysters.

A communication from the American consul at Liverpool was received recently by Governor Odell, of New York, stating that there is a belief in England that oysters taken near New York City and along the Connecticut coast are contaminated by sewage and that they have been responsible for cases of typhoid fever in England. On Jan. 6 the State Forest, Fish and Game commission forwarded to the secretary of state of the United States an affidavit of Superintendent B. Frank Wood of the shellfish department declaring that East river and Blue Point oysters are not contaminated by sewage from New York city; that there is not the slightest possibility of contamination from sewage or any other cause. The Blue Points are taken on the south shore of Long Island, two miles from the mainland, and the East river oysters from sixty feet of water in Long Island sound.

Garbage Disposal in Small Cities and Villages.

Mr. Rudolph Hering, C. E., recently delivered an address on "Garbage Disposal in Small Cities and Villages" before the New York Association of Health Officers, from which the following extracts are made:

The solid refuse matter of a small community may be divided into three general classes: the first consists of the ashes, the second of general rubbish, dry rubbish, including sweepings, and the third the animal and vegetable refuse or garbage proper, otherwise called swill or slop.

The domestic ashes we find, both here and in England, contain a large percentage of unburned coal, about 25 per cent. in round numbers, and therefore the fuel value of these discarded ashes from the houses is quite considerable. On the continent of Europe this is not the case excepting in a very few seaboard towns, and the fuel value of the ashes is very slight. The ashes from some plants in a manufacturing town are, of course, the result of much more careful firing, and in those, in this country as well as in England, we find no unburned coal worth speaking of. The value of this refuse consists in its value for filling up land, making land, and certain of the ashes can have a value in allowing the unburned coal to be used for fuel purposes to assist in burning the other refuse.

The next class consists of the dry rubbish and sweepings, paper, rags, wood, straw, leather, iron and other metals, glass and crockery and sweepings of houses and streets sometimes. That makes up what we might call the dry rubbish of a city. This also has a value. It contains a great deal of material, which, if taken out and assorted properly, can be sold, and in all large cities we have this sorting going on, either on the part of the municipality or on the dumps. The rest of this dry rubbish has no value and it is usually dumped the same as ashes or it can be burned, and it is found that, particularly in our country, its fuel value is considerable. The percentage of combustible matter ranges from sixty to eighty. The danger that lies in this rubbish is the fact that it is liable under certain circumstances to contain infected clothing and infected dust, and it is therefore dangerous to health or may be so, and no other process of neutralizing this danger is practicable except its disinfection or its burning.

The third class of the refuse, which is altogether the most important one, is the animal and vegetable refuse, or the garbage proper. The dangers that lurk in this material are due to the fact that a portion of it is very readily decomposable, particularly due to its large percentage of water and animal matter. It contains about 80 per cent. of water in round numbers, sometimes more and sometimes less. It is characterized by offensiveness if in summer it gets to be twenty-four hours old, or a somewhat longer period in winter. The chief danger, however, consists in its being subject to harbor and probably culture some disease germs that may get in from the house in some way through insects, flies, etc. The value of this material may be fourfold.

The original, and still a common way, of getting a value out of the garbage is to feed it to swine.

The objections to feeding garbage to swine are several. One is that it is proclaimed to be somewhat of a nuisance.

It does not seem as though it were an inherent necessity. The garbage can only be a nuisance if it gets too old and if it lies around the field where the hogs feed on it. If the garbage is collected promptly, collected daily, and if the feeding places are kept clean, there seems to be no reason why it should become a nuisance. The second objection to feeding garbage to swine is that it is dangerous to health. It seems that if the garbage is fed fresh to the swine there is no reason why it should cause trichinosis any more than if the swine are fed on other matter that is likewise not fresh. The third objection is that the pork is claimed to be of poor quality. This can be corrected in some way by frequent garbage collection and proper cleanliness in the process. There is no reason why the food should be of less good quality than other feed which would have to be provided for pork instead of the garbage. Therefore, so far as I am concerned from my observation as an engineer, it seems to me that in small communities and villages, there ought to be no serious objection to disposing of the garbage by feeding it to swine, because in a small city you can have better control of it than in large cities, and the hauls being shorter, the material will always be fresh and therefore in better condition. I do not think that this is a proper method of the disposal of the garbage of large cities.

The next method of garbage disposal is to extract its grease and convert it into a salable product. The process consists of boiling the garbage and in that way getting out the grease. What is left, the so-called tankage, is disposed of in various ways. It has very little value and practically the entire income results from the sale of grease.

Still another method of disposing of this garbage is by its cremation. This is the common method of England, and it is the method most generally advocated in our own country. The advantages of cremation are great. It destroys absolutely the disease germs, it destroys all putrescible matter, and it can reduce the cost of destruction by the production of steam, although it is not done everywhere, and done at a very few places in our own country. The objections to cremation of garbage are several. The odor from the incompletely burned ashes is the first. The remedy for that can only be, in my opinion, the employment of a more intelligent class of firemen. One of the chief reasons why our crematories have given trouble is in the supposition that anybody is good enough to fire them. It requires experience, skill and constant attentive observation. For instance, here comes a load (as I have seen) of paper, wood and straw. It is dumped in upon the fire. Then comes a load of some kitchen garbage and it is dumped upon this fire. There you get a good combustion generally, but I have also seen the reverse. First comes a load of wet, very wet, slop and garbage or kitchen refuse. That is put into the fire; it practically puts out a large portion of it, and then upon this is dumped the paper and straw and readily combustible matter, and that practically has absolutely no fuel value to burn the material that is below it. So one of the chief things to do in operating a crematory is to dump the material in the proper order so that you get the full benefit of its fuel value.

The next objection to the use of a crematory has been the dust, and the burned as well as the unburned particles escaping from the stack. If the draft is not properly regulated a large portion of this matter will go out through the stack. The dust of burned garbage will go out (properly burned garbage) and it will settle in the neighborhood and cause complaint. Some pieces of burned garbage, black paper, and so on, will come out of the stack and float around and settle in yards or go into windows. The remedy for this condition requires two things: The first, I believe, is a better design of the furnaces we have here so as to effect a more complete combustion and, secondly, a better manipulation of the furnaces—the manipulation of charging the fires and of discharging the ashes and so on and largely of regulating the draughts.

In this country many places lack what is called a dust chamber between the furnace and the stack. A dust chamber is necessary for the purpose of reducing the velocity of the gas by having it go through a wider space, and by that reduction of velocity dropping the heavy matter, the dust and larger particles. It is a sort of settling basin for the solid material.

In England we find these dust chambers in every furnace. I have in this country seen but few. The next point is that you

need a sufficient number of dampers. I have seen a number of furnaces here where they had only one damper, right at the chimney. In addition to that there should be one at every furnace (if there are more than one), so that, if you open the doors of one, you shut the dampers of that one and let the other furnaces go on operating as usual.

In order to have the assurance that no gases will go out and no unburned material, it is customary in England and also in most of the furnaces here to have auxiliary fires placed at the foot of the stack, so that all the gases that escape from the grates will pass over or through this auxiliary fire. That is a difficult mechanical proposition, and unless it is very carefully manufactured and managed, it does not do what is theoretically expected; and that also requires skill in the men who have to manage such a furnace.

Another feature of furnaces which has had very excellent results in Europe is an increased draught caused by the introduction of air below the grate, that is, an increase of oxygen, and consequently a better burning of the garbage, and if a forced draught is used, as is done in most English cities, you get a much higher temperature and consequently you can in almost every case there, and in some cases here, manufacture steam by this heat, and the steam operates not only the forced draught, but it can light up the station or it can handle the boxes from the carts and dump the garbage into the furnace.

The last way of disposing of garbage is by ploughing it into the soil. That has been tried in most countries and the advantages are that some soils are physically benefited by it. If you have, for instance, a very tough clay soil and plough in the garbage with all its heterogeneous matter, you loosen it up and increase its capacity for holding water and thereby benefit the crops. It secures better drainage and the decomposition of the garbage matter raises the temperature in the soil, and that benefits the crops. And then we find that after the garbage has been ploughed in for a few years it actually turns into the humus which we see in the black soil of the forests which results from a decomposition of vegetable matter, principally leaves. The great objection to this way is in the great quantity of inorganic matter like glass, pottery, etc., and the concentration of organic matter from the kitchen garbage which must be well mixed up with the soil and other matter, and, lastly, the cost of ploughing the garbage into the soil is sometimes greater than the value obtained from it.

We know that all of the refuse can be hygienically treated, that is, it can be effectively deprived of its objectionable qualities in one or several ways. It remains, then, to take up each town separately and ascertain the element of cost for each one The cost should include that for the collection, for the delivery to the point of final designation and for the final treatment in a satisfactorily hygienic manner. The least costly method is then the proper one for the community to adopt.

Applying this method of careful investigation it is found that in England the cremation of all three classes of refuse is generally the best, and the operation of the furnaces is in the hands of skilled men and is satisfactory as a rule.

In Hamburg the same method is pursued, the plant being the largest in the world. In Berlin cremation is too expensive and cannot be used and there is insufficient grease in the garbage of that large city to pay for reduction.

The solution of the difficulty in all cases lies, I think, in a more careful study of conditions and of the cost of the different processes and in the employment of more expert labor to operate the works than has been thought necessary.

MUNICIPAL AND TECHNICAL LITERATURE

New Publications.

A Treatise on Roads and Pavements. By Ira Osborn Baker, C. E. 663 pp., 171 figures, 68 tables; cloth, $5. New York: John Wiley & Sons.

Prof. Baker has well sustained the reputation gained by his book on "Masonry Construction." There have been several excellent books on the general subjects embraced in the title of this book, which have appeared recently, some of which have treated particular parts of the field more thoroughly and completely than this book, but none gives so complete a survey of the entire subject. A number of chapters are upon topics never before properly treated in a book. There has not been time since the receipt of the book to write a detailed review, but its general scope can be stated and the discussion of details left until a later day. The two general divisions of the book treat of country roads and street pavements, the first occupying 276 pages. Road economics is more fully discussed than elsewhere and the discussion of road location is more strictly scientific than usual.

The chapter on earth roads takes 100 pages and is quite complete. For states like much of Illinois, in the vicinity of Prof. Baker's residence, some such chapter as this is very valuable as it gives the methods of obtaining the best possible roads with the material at hand, but the attitude which he assumes with reference to the relative value of earth roads and roads with actual wearing surfaces is such as to belittle the importance of the addition of good material to the road surfaces and this, if taken strictly as stated, is liable to do injury to the cause of good roads in districts where such good materials are to be obtained at reasonable cost. Indeed it may do injury in such districts of Illinois as are amply able to construct good roads even if their cost is rather excessive, by minimizing the value of really good roads and the financial loss due to being shut out of markets even for a few weeks at critical periods. His remedy of storage at railroad stations will hardly be taken seriously by those who are acquainted with the business methods of the average farmer and his relations with the grain dealers.

Gravel roads are fairly well treated, but not with the intimate knowledge of constructors of such roads in such states as Indiana and Ohio. The seventy pages devoted to broken stone roads is evidently not as full in its treatment as Byrne's book on "Highway Construction."

Street design, pavement economics, sidewalks, bicycle paths and race tracks obtain notice in the second part not heretofore given them. Tillson in his "Street Pavements and Paving Materials" is more detailed in his consideration of stone, brick, wood and particularly asphalt pavements.

As a whole the book is the most comprehensive treatment of its subject which has appeared and will undoubtedly take its place as the basis for any detailed study of pavements. It contains the results of a number of valuable experiments made by and under the direction of the author and makes some positive and original additions to the knowledge of the world on this subject.

Iowa Engineering Society, 14th annual report of proceedings. T. R. Warriner, secretary, Cedar Rapids, Iowa. 164 pp.; paper, 50 cents.

This volume also is a year late in its appearance and should not show the marks of careless proofreading. The papers are upon tunnel construction for underground pipes, laying submerged water pipe, land surveys, ancient and modern, of the United States and Canada, heating and ventilation of certain school buildings, construction of concrete sea walls, village plattings, farm drainage, tracklaying, machinery, sewerage for small towns, etc.

Portland and Other Cements. Pennsylvania's Production of 1901. Supplement to the 29th Annual Report of the Bureau of Industrial Statistics. James M. Clark, Chief of Bureau. 27 pp. paper, with illustrations. Harrisburg, Pa.

This report on Pennsylvania's cement industry for 1901 is by R. W. Lesley, the president of the American Cement Company. It gives a short history of cement and of Portland cement in this country, defines natural and Portland cements, gives average chemical analyses of various American and European Portlands, and some detail of the processes of manufacture and of testing. Data regarding the growth of the industry in this country are quoted from the United States Geological Survey and also with special reference to Pennsylvania. A list of the active cement works in Pennsylvania in 1901 and the total capitalization, production, value, wages, number and time of workmen is appended by the Pennsylvania bureau of statistics. The booklet will be of interest and value to all concerned in the cement trade.

Mr. Lesley has computed some tables showing the production of natural and

Portland cements, and the imports and exports with value for each year from 1892 to 1900, showing the growth in the industry. For some reason he has reduced all the figures to barrels of 300 pounds, whether eastern or western natural hydraulic cement or Portland. This makes it difficult to use the table in comparison with others on account of the difference in basis, and makes the showing for Portland cement over 20 per cent. better than it should be in barrels, on account of the difference in weight. There are so many weights of cement in barrels that some reduction to a common basis is desirable; but if that basis is pounds it will be better understood and not subject to the misconception liable under present forms in comparing Portland with other cements if expressed in pounds rather than in terms of an arbitrary barrel.

As a matter of history, the writer has been informed that the cement works formerly in operation in South Bend, Ind., are not now engaged in the manufacture of Portland cement, as stated on page 9, but are occupied in the manufacture of other products.

Thonindustrie Kalender, 1903. Press of Thonindustrie-Zeitung, Berlin, Germany.

The first volume of this calendar is in pocket diary form with additional leaves for memoranda, and a number of maxims of value in various branches of manufacture treated in the paper. The second volume, bound in paper, has descriptions and illustrations of many devices and pieces of apparatus for use in factories, such as systems of keeping account of time of workmen, calorimeters, testing machines, thermometers, thermostats, pyrometers. It also gives many useful tables, post and telegraph, conversion tables for money, weights and measures, and a list of technical books. About 250 pages are devoted to descriptions of apparatus for clay, cement and similar industries with names of manufacturers. The volumes are of much value and the subscribers to the magazine are doubtless duly grateful for their presentation by the publishers. Possibly others can obtain them on application.

The Minerals and Mineral Localities of Texas, by Frederic W. Simonds, Ph. D., Professor of Geology, Univ. of Texas, 104 pp. paper.

This is Bulletin No. 5 of the Texas Mineral Survey and contains an alphabetical list of the minerals heretofore found in Texas with statement of the localities at which their occurrence has been reported. Asphaltum of various grades is reported in 18 counties, brick clay in 15, coal in 18, fire clay in 4, natural gas in 33, gypsum in 17, lignite in 54, petroleum in 39 counties.

Report of the Chief of Engineers, War Department, Parts 1, 2 and 3.

This voluminous report contains the usual sketches of the construction work under the department, including fortifications, river and harbor improvements, etc. Mention may be made of the study of the Tennessee river in Appendix C C, of the commerce of the Ohio river in Appendix D D, and the statements of technical details in Appendix Z Z, including waterproofing of concrete wall, cement tests, stoppage of leaks with linseed oil, concrete laying and oiling roads.

ORGANIZATIONS AND INDIVIDUALS

National Brick Makers—New York Road Supervisors—Interstate Builders' Supply—Technical Meetings—Efficient Officer Retires—Personal Notes.

National Brick Manufacturers' Convention.

The 17th annual convention of the National Brick Manufacturers' Association will be held in Boston Feb. 12 to 14. Headquarters during the convention will be at the Brunswick hotel, where a minimum rate of $4 per day (American plan) will be made for rooms occupied by one person and $3.50 per day where occupied by two or more persons. Some of the papers to be submitted are: "Raw Clay as a Commercial Commodity," Prof. E. R. Buckley, Rolla, Mo.; "Progress in Brickmaking," F. E. Frey, Cleveland, O.; "The Essentials to Success in the Manufacture of Dry Pressed Brick," O. K. Edwards, Norberg, Ore.; "Salt Glazing Brick," Isaac Hardy, Worksop, England; "How Not to Sell Brick," Wm. G. Titcomb, Providence, R. I.; "Electricity in the Brick Plant," general discussion led by Horace Purinton, Waterville, Me.; "The

Economy of the Continuous Kiln," Chas. Burnham, Milwaukee, Wis.; "Drying Brick," B. P. Hollett, Arcadia, Ind.; "Natural Air Dryer vs. Artificial Dryers," L. C. Moore, Memphis.

Prof. Edward Orton, Columbus, O., will submit the report of the committee on technical investigation, and Prof. H. A. Wheeler, St. Louis, Mo., the report of the committee on exhibit of clay products at the St. Louis World's Fair. Questions for general discussion will be as follows:

Has it proved in actual wear of the street that bevel-edge paving brick or block are better than the square edge, repressed or otherwise?

Is it an improvement to a brick or block pavement for them to have what is generally called a lug on one side?

Which is the best filler for a brick pavement—cement grout or hot sand?

Has the testing system for paving brick adopted by the N. B. M. A. been satisfactory to the manufacturers?

Has not the time arrived to decide definitely upon the size of brick best adapted to street pavements, and, if so, what is that size?

What is the safe average percentage of saturation of the atmosphere which can be used in estimating or in the installation of waste heat dry houses?

Allowing that air can be introduced into the dry house by means of waste heat at an average temperature of 275 degrees, what is a safe quantity of air per minute necessary to dry one thousand brick in twenty-four hours, one and one-half pounds of water being taken as an average amount to be evaporated from each brick?

Is it possible to have too swift a circulation in a dry house, provided maximum temperature can be maintained?

Can black-headers such as the early brickmakers of Philadelphia made when burning with wood, be produced if coal is used for burning?

On account of the latent heat consumed in converting water into vapor, is it possible to get a temperature in the hot end of the dry house above 212 degrees until brick are thoroughly dry, even if air is introduced considerably above that temperature?

Is it practical to reburn a clamp of soft brick?

Does it take more fuel to reburn a kiln of poorly burned brick than it would to burn a kiln of green brick? If so, why?

Are not continuous kilns with high stacks a coming sanitary requirement for brick plants situated in or near towns?

What English words can best be used for the two types of continuous kilns, "ringofen" and "kammerofen," or had we best use the German words?

Is not the "ringofen" more practical for common brick than the "kammerofen"?

What form of railroad car is most advantageous for the brick manufacturer, and couldn't the united action of brick manufacturers induce the railroad companies to provide such a car?

Are grate bars an advantage in furnaces of permanent kilns?

Do not the fire-brick manufacturers need the educational and social advantages of the N. B. M. A.? Why do not more of them join the association?

Do the various United States patents on artificial sandstone brick cover the mixtures of lime and sand, or the process of manufacutre, or only the kind of machinery used?

How many systems are there? Wherein do they differ? And which possesses the most commendable points?

What are their frost-resiting qualities? How will they stand in a climate like Boston? Will lime slack in an air-tight cylinder?

What quality do the clays of New England possess which causes the arch brick or headers to burn as they do, and why cannot brick commonly known as "Harvard" headers and stretchers be made elsewhere?

Is anyone using a red brick stain successfully for improving the color of a naturally inferior clay?

New York Road Supervisors' Convention.

The good roads convention which was held in Albany, N. Y., Jan. 20 and 21 was made up of delegates from the various county boards of supervisors, over 200 of whom were present. State Engineer Bond called the convention to order and J. W. Potter was elected the permanent chairman. The standing committee of the previous convention made a report explanatory of a number of recommendations. After two days' discussion of these recommendations they were adopted as follows:

1. That $2,000,000 appropriation be asked from the legislature for next season's work. This amount is asked for because the people have petitioned for 470 miles of road and the counties have appropriated over $2,000,000 for construction, and, according to the present law, the state can pay half the cost. This appropriation would permit the construction of the entire amount now ready for construction.

2. That the legislature be petitioned to bond the state for $50,000,000 for highway improvements. It is proposed to issue these bonds not more than $5,000,000 a year, and to levy a tax to pay the interest and two per cent. annually for a sinking fund.

3. That a state wide-tire bill be introduced to protect the highways from the destructive action of narrow tires. Several counties now have such laws which are reported to be satisfactory.

4. That a state sign-post law is desirable.

A resolution was passed favoring a bill taxing automobiles for the benefit of the road repair fund, a license for one county being valid in all counties in the state.

The Brownlow bill, proposing to appropriate $20,000,000 for national aid of road construction, was indorsed, apparently because it applies the principle of the Higbie-Armstrong law of New York to the nation and because— New York would get $2,000,000 of the fund. There seems to have been no suggestion that a law applicable under the more detailed form of government of a state may be con-

trary to the fundamental principles of the union of the states, and no one seems to have considered the appropriation in the light of the application of funds collected for the common good of all to the local benefit of those having the ear of the director, and thus as a plain raid upon the treasury.

A resolution was unanimously carried recommending to the favorable consideration of boards of supervisors the law under which they can appoint county engineers to supervise construction and repair of roads and bridges.

The submission to voters of a proposition to change the method of caring for highways from the labor system to the money system was recommended to the towns of the state. Legislation authorizing the removal of snow under the money system was recommended as an object lesson in this regard.

The secretary of the meeting was Arthur Warren. The standing executive committee for the ensuing year is John B. Uhl and Albert R. Shottisch of New York, Joseph B. See, C. H. Weygant, Dr. E. J. Bedell of Albany; Henry McNamee, G. W. Freligh of Schnectady; G. H. Whitney of Saratoga; W. Pierrepont White, Frank Z. Wilcox, Joseph H. Brownell, Charles F. Chamberlain, Ira P. Cribb, Frank T. Herrick, Jas. A. Mensies, and F. B. Parker.

The recommendations of the standing committee at this convention and the data upon which they are based are printed in a pamphlet which can be obtained of State Engineer E. A. Bond of Albany.

The Interstate Builders' Supply Association.

The Inter-State Builders' Supply Association held its annual meeting in Indianapolis Jan. 20 and 21, 1903. While the association has been in existence several years it seems to have become a vigorous organization a year ago and this convention showed an increasing interest and attendance. The active membership now includes some seventy-five of the representative dealers in builders' supplies from Baltimore to Kansas City and the manner in which they are taking hold of the society makes it a power in its field which must be taken into acount hereafter. The constitution was changed at this meeting and manufacturers can now become associate members. A large number of manufacturers of cement, lime, plaster, brick and other building materials were represented and expressed through their agents their approval of the objects of the organization.

The subjects discussed at the meeting were the affiliation of manufacturers and dealers, the car service question, several papers upon technical subjects, such as the manufacture and use of Portland cement. Twenty-seven new members were received during the meeting and an addition of 37 during the year was announced. The representative dealers and sales agents of Chicago, Kansas City, St. Louis, Cincinnati, Indianapolis, Cleveland, Buffalo, Pittsburg, Baltimore and many smaller cities are included in the membership.

The meeting closed with an enjoyable banquet on Wednesday evening, at which both active and associate members were outspoken in their approval of the association.

At a meeting of the executive committee on Jan. 22, that board decided to meet again on the second Monday in April and to decide at that time the time and place of the midsummer meeting of the association.

The officers for the ensuing year are: John A. Kling, Cleveland, O., president; C. E. McCamon, Cincinnati, O., first vice-president; Gordon Willis, St. Louis, Mo., second vice-president; J. N. Thayer, Erie, Pa., treasurer; Richard Kind, Toledo, O., secretary; C. W. S. Cobb, St. Louis, Mo., D. J. Kennedy, Pittsburg, Pa., A. B. Meyer, Indianapolis, Ind. C. H. Little, Detroit, Mich., W. C. Wright, Chicago, Ill., executive committee.

Technical Meetings.

The ninth annual convention of the League of Ohio Municipalities will be held in Hamilton Feb. 10, 11 and 12.

The annual meeting of the Connecticut society of Civil Engineers will be held at Hartford, Conn., Feb. 10.

The next annual meeting of the National Good Roads Association will be held in St. Louis, Mo., April 27 to May 2.

The annual meeting of the American Road Makers will be held in Detroit, Mich., Feb. 13 and 14. The general topics for discussion will be the proposed plan for inter-capital connecting improved highways in the United States, Canada and Mexico to be constructed and maintained by the co-operation of the federal, state, county and township governments; the Brownlow bill, providing for the creation of a bureau in the department of agriculture, involving an appropriation of $20,000,000 for the purpose of co-operating with the various states in the construction and maintenance of public highways.

The eleventh annual convention of the Northwestern Electrical Association was held in Milwaukee, Wis., Jan. 21, 22 and 23. Among the papers submitted were the following: "Testing Department of the

Central Station," Prof. G. D. Shepardson; "Metal Preservation," Prof. A. H. Sabin; "Rates and Methods of Charging," J. W. Shuster; "Light and Modern Illumination," W. D. Ryan.

The eighteenth annual convention of the Illinois society of Civil Engineers and Surveyors was held in Aurora Jan. 21 and 22. Among the papers submitted were the following: "The Real Estate Records of a Great Railway System," H. I. Orwig; "The Proposed Co-operative Survey of Illinois," W. H. Herron; "Farm Drainage," L. Z. Jones; "Open Ditch Drains," P. C. Knight.

The semi-annual convention of the New York State Electrical Contractors was held in Syracuse Jan. 19 and 20.

The eighth annual convention of the Illinois Clay Workers' Association was held in Bloomington Jan. 6, 7 and 8. Officers for the ensuing year were elected as follows: President, Edgar Heafer, Bloomington; vice-president, George W. Walters, Chatsworth; treasurer, William Hammersmith, Elmhurst; secretary, G. C. Stobl, Wheaton.

The engineers' society of Western Pennsylvania has elected officers for 1903 as follows: President, Chester B. Allbree; vice-president for one year, James M. Camp; for two years, Samuel Diescher; directors, two-year term, Prof. S. M. Kitner and S. M. Taylor; treasurer, Prof. A. C. Frost; secretary, C. W. Ridinger.

The annual meeting of the New England Water Works Association was held in Boston Jan. 14. The election of officers for the ensuing year was reported as follows: President, Charles K. Walker, superintendent water works, Manchester, N. H.; vice-presidents, V. C. Hastings, Concord, N. H.; George P. Wescott, Portland, Me.; Edwin C. Brooks, Cambridge, Mass.; E. W. Kent, Woonsocket, R. I.; H. N. Turner, St. Johnsbury, Vt.; J. C. Hammond, jr., Rockville, Conn.; secretary, Willard Kent, Narragansett Pier, R. I.; treasurer, L. M. Bancroft, Reading, Mass.; editor, Charles W. Sherman, Boston; advertising agent, Robert J. Thomas, Lowell, Mass.; additional members of the executive committee, P. Kieran, Fall River, Mass.; H. G. Holden, Nashua, N. H.; finance committee, E. J. Chadbourne, Wakefield, Mass.; W. F. Codd, Nawtucket, Mass.; A. R. Hathaway, Springfield, Mass.

The report of the secretary showed that at the close of the year the association had 522 active, five honorary and sixty associate members, a total increase of thirty-two during twelve months. The principal paper for the meeting was read by Leonard Metcalf of Boston on "The Echo Lake Dam at Milford, Mass."

The annual meeting of the Scranton Engineers' Club was held in Scranton, Pa., Jan. 16. Officers were elected as follows: President, B. F. LaRue; vice-presidents, W. M. Markle and E. M. Zehnder; secretary, A. E. Lister; treasurer, J. E. Parrish.

The Engineers' Club of Portsmouth, N. H., has elected officers as follows: President, Lee Treadwell; vice-president, W. B. Hayes; secretary, H. L. Hilton; treasurer, J. J. Ruckes, jr.; executive committee, H. W. Hobbs, F. O. Holmes and C. F. Carman.

The American Society of Civil Engineers elected officers at its annual meeting in New York City in January as follows: President, Alfred Noble, New York City; vice-presidents, L. F. G. Bouscaren, Cincinnati, O.; James C. Schuyler, Los Angeles, Cal.; treasurer, Joseph M. Knapp, New York City; directors, Alfred Craven, Yonkers, N. Y.; Joseph O. Osgood, Plainfield, N. J.; George S. Davison, Pittsburg, Pa.; E. C. Lewis, Nashville, Tenn.; Hunter McDonald, Nashville; Elwood Mead, Cheyenne, Wyo.

The twenty-third annual convention of the Iowa Brick and Tile Association was held at Ames, Ia., Jan. 21. Officers were elected as follows: President, O. T. Denison, Mason City; vice-president, . F. Morrey, Ottumwa; secretary, I. W. Williams, Ames; treasurer, C. J. Holman, Sargent Bluffs.

The Minnesota State Good Roads Association held its annual meeting in St. Paul the week beginning Jan. 19. Among the papers read were the following: "Municipal Highways," George W. Sublette, Minneapolis; "The County Commissioner and the Public Road," R. M. Hall, president of the Olmsted County Good Roads Association; "Modern Road Machinery," Prof. William R. Hoag of the State University; "Highway Supervision," C. A. Forbes; "The Automobile and Its Relation to Good Roads," E. J. Phelps, Minneapolis. Officers were elected as follows: President, G. W. Cooley, Minneapolis; secretary and treasurer, George L. Wilson, St. Paul.

An Efficient Officer Retires.

Mr. C. A. Brown, who has been superintendent of streets in Cambridge, Mass., for nine years, and in the employ of the city for twenty-six years, has retired from his position. Information from the vicinity indicates that the change is made on account of a change in political affairs. Mr. Brown is considered an authority in New England upon street and road construction and maintenance and was recently the president of the Massachusetts State Highway Association. The setting aside of an experienced and efficient municipal officer in a technical department on account of the exigencies of

political manipulation is a calamity which the citizens will not always suffer without resistance. Politics has its proper place in a municipal administration, provided it is local politics and not the state or national brand, but that place is not in the technical departments of the city government. The better the man displaced under such conditions the stronger the disgust at such action and the more likely it is to result in protest and final removal of such offices from direct political control. Mr. Brown may not have suffered in vain.

Personal Notes.

Walter Walsh has been re-elected mayor at Mobile, Ala.

E. H. Williams has been elected mayor at Abbeville, Ga.

David Stevens has been re-elected city clerk at Newport, R. I.

Jackson I. Case, former mayor of Racine, Wis., died Jan. 6.

The Hon. J. Robertson has resigned as mayor of Strathroy, Ont.

R. H. McLennan has been elected mayor at Dawson City, Alaska.

James F. Fisher has been elected city engineer at Williamsport, Pa.

Samuel K. Peck has been elected water commissioner at Windsor, Ont.

Merritt W. Yeater has been re-appointed city engineer at Beaumont, Tex.

Charles L. Goodhue has been re-elected water commissioner at Springfield, Mass.

C. F. Westcott has been elected superintendent of streets at Haverhill, Mass.

Lucius H. Murch, city clerk at Belfast, Me., died Jan. 8, aged sixty-four years.

William H. Barton has succeeded Alfred Davies as city clerk, at Saginaw, Mich.

Fred Crandall of Indianapolis has been appointed city engineer at Muncie, Ind.

John Van Den Bosen has been appointed street superintendent at Auburn, N. Y.

Joseph R. Jewell has been elected superintendent of water works at Summit, Miss.

Mell C. Fallett, city clerk of Moline, Ill., died in Chicago, Jan. 9, of heart failure.

Hon. Abram S. Hewitt, former mayor of New York City, died January 18, aged 61 years.

Frank Rice and W. S. Duncan have been elected water commissioners, at Atlanta, Ga.

J. A. Vaillancourt has resigned as manager of the Berlin Water Company at Berlin, N. H.

Henry C. Hall has been appointed town clerk at Norwich, N. Y., to succeed A. Robert Choules, resigned.

Daniel E. Hoffman has been elected superintendent of water works at Lancaster, O., to succeed A. C. Miller.

J. W. Barnett has been re-elected city engineer and W. L. Wood superintendent of streets at Athens, Ga.

Col. W. S. Nock has been elected president of the board of water works commissioners at Covington, Ky.

Andrew Rinker has been appointed city engineer at St. Paul, Minn., which position he formerly held for sixteen years.

Walter McCulloh has been re-appointed city engineer and C. R. Phelps street superintendent at Niagara Falls, N. Y.

C. C. Ewing has been appointed superintendent of water works, to succeed B. Perkins, resigned, at East Liverpool, O.

John H. Scott has been elected councilman of the Second ward at Montclair, N. J., to succeed Benjamin V. Harrison.

T. E. Golden, E. T. Roberts, George A. Pearce and John C. Cook have been elected water commissioners at Columbus, Ga.

Augustus C. Blain has been appointed superintendent and Ovid F. Winslow assistant superintendent of streets at Nashua, N. H.

Frank P. Cobb has been re-appointed city engineer and Maurice Kennedy superintendent of streets at Chicopee, Mass.

Frederick W. Lawson has been elected president and James St. Clair vice-president of the board of aldermen at Fall River, Mass.

John Ronan has been elected superintendent of highways and H. H. Landfort superintendent of sewers at Newburyport, Mass.

W. H. Lawton has been elected city engineer and William Hamilton street commissioner and surveyor of highways at Newport, R. I.

John H. Church has been elected superintendent of streets, P. H. Core water commissioner and G. A. King city engineer at Taunton, Mass.

J. L. Burke has been elected mayor at Guntersville, Tenn., and Sam Henry, T. L. Farrow, W. C. Jordan and P. B. Lusk have been elected aldermen.

Dr. John Amyot of the Provincial Biological department addressed the Canadian Institute at Toronto, Ont., on the subject of sewage disposal.

Ira E. Farmer has been elected mayor and W. R. Hadley, H. A. Burnside, T. A. Brinkley and John S. Boyd councilmen at Thomson, Ga.

A. T. Smith, former city engineer at Eureka, Cal., and who was defeated at the last election 34 votes, is practising as a civil engineer at 325 J-st.

T. J. Kent has been elected mayor at Stillwell, Ga. J. M. Dewberry, J. V. Trever, J. L. Cleary and W. J. Higgins have also been elected aldermen.

Robert G. Mitchell, Jr., has been elected mayor and A. P. Brantley, John A. Strickland, J. A. Harper and W. G. McMillan councilmen at Blackshear, Ga.

James A. McClure, city clerk at Crawfordsville, Ind., died at Las Cruces, New Mexico, Dec. 31, aged fifty-five years. Mr. McClure had been city clerk since 1898.

E. von der Osten has resigned his position as chief engineer of the engineering department of the United States Garbage Reduction Company at Lynn, Mass

George F. Townsend has been appointed a member of the board of works at Watertown, N. Y., to succeed C. N. Longtin, and Smith T. Woolworth to succeed Charles W. Clare.

E. W. Merry has been elected president, F. A. Baldwin vice-president, A. W. Rudolph secretary and M. L. Case treasurer of the City Water Works Company at Bowling Green, Ohio.

Percy B. Taylor, Luther D. Martin and Herbert B. Taylor have incorporated the Taylor-Martin Engineering Co., Newark, N. J., and will engage in civil, mechanical and electrical engineering.

The Hon. John H. Boylen, who was reelected mayor of Gloucester City, N. J., in November, was administered oath of office in bed, Jan. 1, where he had been confined with typhoid fever several weeks.

J. N. Ambler, professor of mathematics and astronomy of Roanoke college has been elected city engineer at Salem, Va., which position he will hold in addition to his connection with the college, which is located in Salem.

Hakira Ito, of Tokio, Japan, is visiting America for the purpose of studying American bridge building, under the supervision of experts. Mr. Ito will spend most of his time while here in the shops of the American Bridge company, where he will do practical work.

Edwin R. Davis, civil and mechanical engineer, has established an office at 6 Beacon-st., Boston, Mass., and will make a specialty of water supply and sewage disposal. Mr. Davis was for several years associated with the late Col. George E. Waring, jr., of New York City.

John B. Ansley, who has been city engineer at Americus, Ga., for several years, has resigned to accept a position as superintendent of the construction of a sewerage system at New Orleans. Assistant Engineer Spier will fill his place until a successor is appointed.

James D. Fish was declared mayor of Beverly, N. J., by Judge Nixon, who heard testimony Dec. 29 in the contested election case between Mr. Fish and Dr. E. S. Adams. The court decided that Mr. Fish was elected by one majority. Dr. Adams may appeal to a higher court.

Superintendents of water works have been elected as follows: J. H. Smith, Mt. Carmel, Pa.; Paul Dato, Hillsboro, Tex.; John Lindquist, St. Paul, Minn.; Daniel E. Hoffman, Lancaster, O.; Alex Orr, Gloversville, N. Y.; David H. Hooper, Waynesboro, Pa.; George T. Ingersoll, Schenectady, N. Y.

Mayors were elected in Ontario, Canada, Jan. 5 as follows: Urquhart, Toronto; M. K. Halloran, Brantford; G. H. Hamilton, Guelph; W. J. Marden, Hamilton; J. Bell, Kingston; F. Cook, Ottawa; W. Hepburn, Stratford; J. White, Woodstock; C. F. Maxwell, St. Thomas; W. C. McKeough, Chatham; Alexander Ross, Fort Erie.

D. W. H. Moreland, Commissioner of Public Works, Detroit, Mich., has been so unfortunate as to break his ankle by slipping on an icy street and thus to be confined to his house for several weeks. George Kellogg, an employe of his department is suffering from a dislocated hip, obtained in a similar manner.

Mayor Bookwalter of Indianapolis is president of the American Bowling congress and is an enthusiast over the sport. In the tournament to be held at Indianapolis this month he will enter with one of the all-star teams as well as in the two-men class. Robert Bryson, member of the board of public safety, is one of the best bowlers of the West and is secretary of the local Bowling Tournament association.

Mayor Albert A. Graves was inaugurated Jan. 5, succeeding Hon. Fred T. Moore as mayor of Saginaw, Mich. John Rudge was elected president of the council; W. W. Beckton chairman fire department committee; James Fitzgerald chairman committee on ordinances; Michael Burkholder chairman committee on sewers; William F. Wagenseil re-elected city clerk; Fred Hill chairman committee on electricity; Fred A. Fish chairman street opening committee.

John Wharton Maxcy, who has had charge of much of the important engineering in Houston, Tex., and William E. Anderson, for a number of years the mechanical engineer of the American Cotton Company, have formed a partnership as Maxcy & Anderson, civil and mechanical engineers, with offices at 204-205 Binz building, Houston. They will conduct a general consulting engineer business, and particularly the engineering of irrigating plants, of which a great number are being built in Texas and Louisiana.

Estevan Antonio Fuertes, C. E., died at his home in Ithaca, N. Y., Jan. 16, aged sixty-five years. Mr. Fuertes was for nearly thirty years director of the College of Civil Engineering, Cornell University. He was born in San Juan, Porto Rico, in 1838, and from 1861 to 1863 he was employed in the public works department of that city. From 1864 to 1869 he was engineer of the Croton Aqueduct board, New York. In 1873 he gave up his practice as a consulting engineer, which he had followed the two preceding years, to accept the appointment in Cornell University, and under him the department of civil engineering in that university became one of the most important engineering colleges. He was the first person to advocate laboratory work in civil engineering schools.

MACHINERY AND TRADE

Toronto Officials Approve Warren's Bituminous Macadam.

The assistant street commissioners of Toronto, Mr. William J. Evans and the city roadways engineer, Mr. Charles W. Dill, recently visited London, Ont., to inspect a street just laid with Warren's Bituminous Macadam Waterproof Pavement, laid according to specifications which have been published in the magazine. Two laborers spent ten minutes in cutting out a section a foot square and it was found that the stones broke across instead of pulling out of the cement, though the pavement was but two days old.

Mr. Dill thought the pavement would easily outwear asphalt, costing about the same as the light asphalt streets. Mr. Evans thinks this pavement has solved the problem of a permanent pavement, not grinding or cracking to pieces, resisting water and affording horses a firm foothold. He considers the theory of the construction correct, and that the pavement will sucessfully stand the test of weather and usage.

American Filter Plants Abroad.

The New York Continental Jewell Filtration Company report that they have received an order from the York Water Works, York, England, for an additional filter plant, to have a daily capacity of 2,000,000 imperial gallons. The Filter Company installed a filter plant at York last year with a daily capacity of 4,000,000 gallons, which is now to be increased to 6,000,000 gallons.

The same company also report an order from the Hungarian government for the equipment of the Royal Hungarian R. R. near Buda Pesth.

They also report an order for an addition to the Boiler Feed Water Purifying plant at the 179th-st. pumping station of the Manhattan Department of Water Supply, New York City.

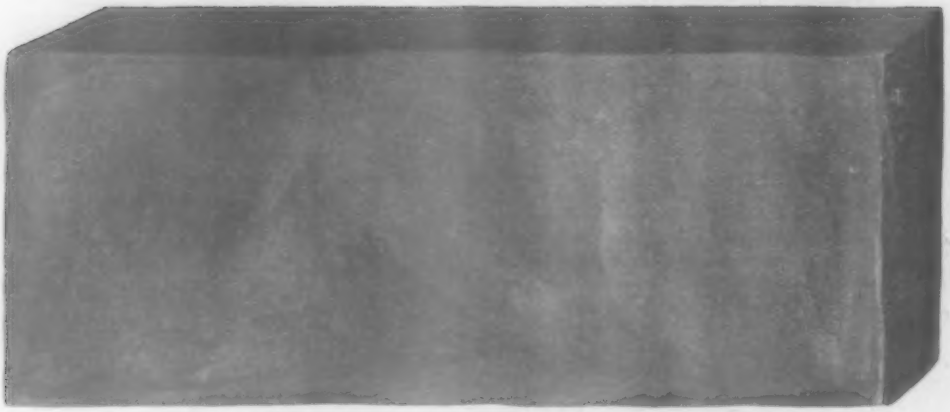
Kentucky Cities Can Contract for Patented Pavements.

On June 17, 1902, the city of Newport, Ky., contracted with the Central Bitulithic Paving Company of Cincinnati for paving Columbus-st., from Third to Fourth, with the Bitulithic Pavement, otherwise known as Warren's Bituminous Macadam Waterproof Pavement. The work was completed Aug. 14, 1902, A temporary injunction was issued Aug. 11, 1902, on suit of William Finneran, preventing the payment by the city of the money due for the pavement, the principal ground of the suit being that the pavement was patented and that the city could not legally specify a patented pavement on account of being a monopoly. It is thought that the real persons behind the suit are contractors for other pavements. The case was argued before Judge John W. Hodge at Newport on Oct. 27 and on Dec. 20, 1902, the judge delivered a verbal opinion dissolving the injunction and permitting the payment of the contractors, thus deciding that the city had the right to specify and contract for a patented pavement.

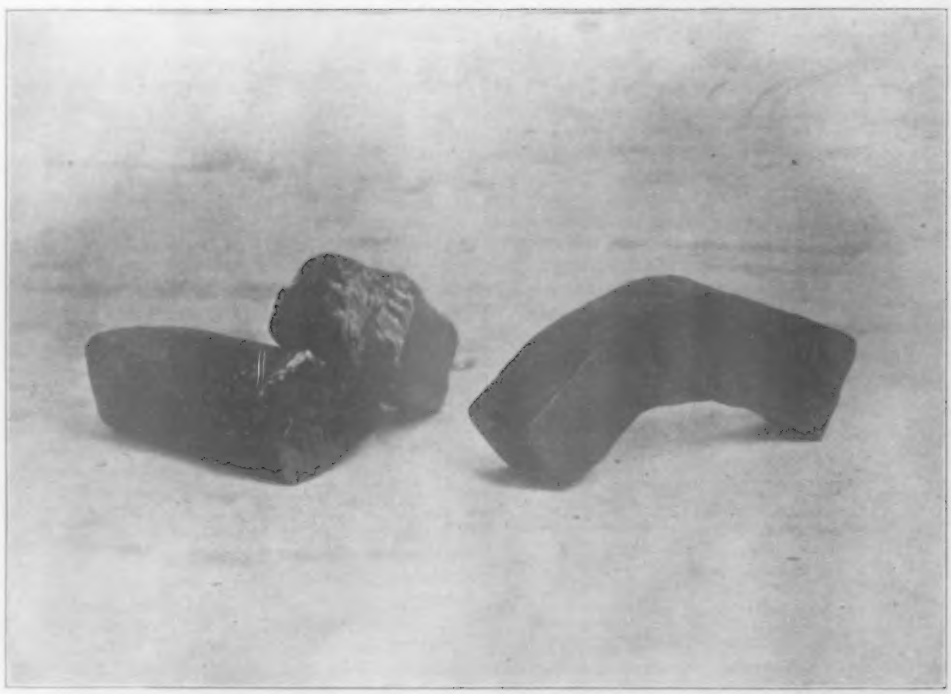
A New Bituminous Filler for Brick, Granite and Wooden Block Pavements.

In the construction of brick pavements as well as granite and wooden block pavements, engineers have for years unsuccessfully sought to obtain a filler for the interstices which would make the pavement water tight so as to protect the foundation. Manufacturers of coal tar and asphaltic bitumens too have been aware of this need but have been unable to produce such a filler owing to the character of their products. The desirable qualities of a filler for block pavements are considered in an article entitled "The Advantages of a Bituminous Filler for Brick Pavements," which will be found on another page in this number of Municipal Engineering.

The need of an article will sooner or later bring forth the article, and the National Bitumen supplies the long desired want. It is a pure bitumen, rubbery in character, and in its natural condition (that is, without the admixture of sand, stone or gravel,) will stand erect at high temperatures, even in boiling water without losing its form, and will not become brittle at zero F. By using the bitumen only in the interstices and expansion joints a perfect joint is made that is absolutely water tight and provides for the expansion and contraction of brick and wood pavements, as well as to deaden the sound of brick and granite



NATIONAL BITUMEN AFTER ONE HOUR AT 160° F.

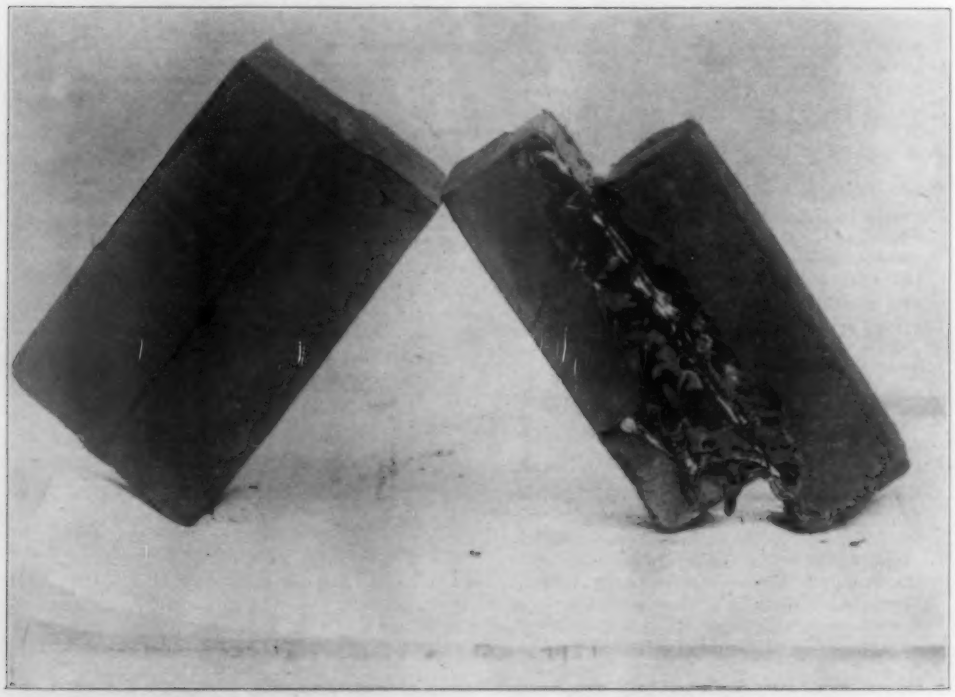


No. 6 COAL TAR PITCH BROKEN AT 40° F.

NATIONAL BITUMEN WOULD NOT BREAK.

NATIONAL BITUMEN SHOWS HAMMER MARKS. NOT BROKEN AT 40° F.

COAL TAR PITCH BROKEN BY HAMMER AT 40° F.



BRICKS CEMENTED WITH NATIONAL BITUMEN DID NOT MOVE.

BRICKS CEMENTED WITH No. 6 COAL TAR PITCH SLID FROM HEAT.

pavements. It gives and takes in a rubbery manner so that when the brick expands it compresses, and when the bricks contract it expands. The pictures accompanying this article indicate the action of the material, the first showing the effect of exposure to 160 degrees F, and the second a comparison of the action of National Bitumen and coal tar pitch at 40 degrees F. The fourth cut shows the effect of hammer blows with the same materials and temperature. The third cut compares the two as cementing bricks together.

The National Bitumen does not become brittle under low temperatures, so that the vibration of the pavement will not affect it. The experiments indicate that it will remain as long as the brick, granite or wood block, so that the pavement at all times is water tight.

It is especially valuable to brick pavements, for noise and expansion will both be taken care of. Too great stress cannot be laid on these features in considering the pavement of residence streets.

Another important advantage obtained by the use of this bitumen is that expansion joints can be made in brick and granite pavements along street car rails, inside and outside, to protect the street pavement and the pavement within the tracks from the vibration of the rails.

If for any reason it is desired to use cement grout in the body of the street, an expansion joint of one inch can be put on each side of the street, and a like joint at right angles with the street every fifty feet, to be filled with the National Bitumen. Of course, this form does not produce as great an effect in deadening sound as the exclusive use of the bitumen.

The National Bitumen does not require the admixture of sand or gravel or broken stone to keep it in place. To get the best results, ingineers and contractore are instructed to see that the interstices are kept free from sand, stone or gravel, and are filled with the National Bitumen only. If desired, sand may be spread on the top of the filler before it cools.

Asphalt for Pavements from Texas.

The Texas Asphalt Company of Beaumont, Tex., has been organized for the purpose of placing refined Texas asphalt on the market. The general trade will be supplied, but the company expects to meet particularly the demand of paving contractors throughout the country, claiming that the material they furnish is equal to the best, and is especially adapted for street paving purposes. The company is now prepared to make attractive contracts with responsible consumers of asphalt for their product. The trade mark selected is the "Lone Star," thus keeping attention on the fact that it is from Texas. As a home product it deserves special attention as well as on its merits for paving and other purposes

The Bitulithic Pavement in Cambridge, Mass.

The following is an extract from the annual report of Charles A. Brown, superintendent of streets, Cambridge, Mass., and late president of the Massachusetts Highway Association, in his annual report to the Mayor and City Council for 1902:

A great deal of interest has been shown here and among numerous other cities in the vicinity, in the bituminous macadam (The Bitulithic Pavement) laid in the fall of 1901 on Temple-st. We have watched it very carefully, and at the present time it shows absolutely no signs whatever of wear or disintegration. It seems to me that the laying of this particular pavement is no longer an experiment; it has been demonstrated that it is a durable, economical and sanitary method of constructing streets, particularly in residential sections. A very large amount of it has been laid during the past year in cities in this state, such as Lowell, Worcester, Lynn, Waltham, Holyoke, Everett and Brookline. And within the past few months Bowdoin and Hancock-sts. in Boston, two streets with exceedingly steep and difficult grades, have been selected by the present superintendent of streets of Boston to be built of this pavement.

In view of all this it would seem a desirable thing to lay it on Massachusetts-ave., from Central square to Quincy square, one of the sections of Massachusetts-ave. which has been exceedingly difficult and expensive to keep in anything like good condition.

I would also suggest that whenever permanent repairs may be necessary on the streets in the Cambridge Heights district, that this pavement be laid.

A Conveyor for Crushed Stone.

We present herewith a picture of a conveyor for crushed stone made by the C. O. Bartlett and Snow Company of Cleveland, O.; for the Kelley Island Lime and Transport Company of Marblehead, O., which has some special advantages for this kind of work. It consists of the following:

One single strand of special malleable iron chain, using No. 4 attachment for No. 50 chain. Each link is made in the form of a special attachment extending up several inches above the axles, entirely out of the way. To these attachments are fastened special concave steel flights. These flights, taken as a whole, make as it were, one continuous concave trough. The links are fastened together with special steel axles to which are fastened special rollers which run on an iron track. It is operated as follows: The crushed stone or other ma-

BROKEN STONE CONVEYOR OF C. O. BARTLETT & SNOW COMPANY.

terial to be conveyed is dumped or shoveled, as the case may be, onto this special conveyor which conveys it along. There is a special dumping device for dumping the material at any point along the conveyor. This dumping device is made in the form of a plow. As the material is conveyed along, the crushed stone comes in contact with this plow, which plows it off on both sides, letting it drop into the bins until the bins are filled up to the track, when the plow or dumping device is moved along and empties the material into any part of the bin. It requires very little power to drive this conveyor, the motion being very slow. The conveyor is very durable, and has now been in operation a long time. It has a very large capacity. It can be built almost any length or capacity desired.

This company also makes dryers for stone and other materials. They report recent sales of their grill four-compartment dryers to the Bronson Portland Cement Company, Bronson, Mich., the Illinois Central Railroad Company, Chicago, Ill., the Colonial Construction Company, Hudson, N. Y., and others under erection for the St. Louis Portland Cement Company, St. Louis, Mo., and the Egyptian Portland Cement Company, Detroit, Mich.

Trade Publications.

The American Sewer Pipe Company of Pittsburg, Pa., issues a catalogue and price list of sewer pipe, chimney tops, flue linings, coping, hollow blocks, paving brick, fire brick, etc., manufactured at its numerous works in Ohio, Indiana, Michigan, Pennsylvania and West Virginia, which contains also much valuable information about the uses of the materials manufactured and of other materials used with them.

The Wm. B. Scaife & Sons Company of Pittsburg, Pa., issues a handsome and complete illustrated treatise on the softening and purification of water by the Scaife and We-fu-go systems, showing the methods of adaption of the systems to all industrial purposes and showing the application of each to the conditions as found. It contains much information of value upon its subject.

Advance catalogue No. 8 of the Pacific Flush Tank Company, Chicago, illustrates the new siphonic apparatus for bacterial sewage filters devised by Mr. Sidney W. Miller, in addition to the patented apparatus of S. H. and M. J. Adams which the company has acquired. Single, double, triple and plural automatic alternating siphons, automatic sewage feed, and timed syphons are shown.

"From Steelton to Mandalay" is the title of a booklet describing the Gokteik viaduct in India, erected by the Pennsylvania Steel Co., of Steelton, Pa.

Burton J. Ashley, civil and consulting engineer, Chicago, issues an illustrated statement of his experience in various branches in engineering, mainly municipal and sanitary.

Complete Catalogue No. 72 of the Jeffrey Mfg. Co., Columbus, O., lists and describes their elevating, conveying and power transmission machinery. It is illustrated with photographs of the machinery and gives gross prices. Other apparatus, such as concrete mixers and coal mining apparatus, are included. The book contains 372 pages.

The Weston Electrical Instrument Co. is distributing copies of the decision of the court in their favor upon the subject of electrical measuring instruments.

Noyes F. Palmer, Brooklyn, N. Y., issues a special circular descriptive of his adjustable cast stone press with detailed illustrations of the latest machine built.

Calendars have been received from the Pittsburg Meter Company, East Pittsburg, Pa.; two from the Christensen Engineering Company, Milwaukee, Wis.; Houston Brothers' Company, Pittsburg, Pa., a diary; Port Huron Engine and Thresher Company, Port Huron, Mich.; The Peebles Paving Brick Company, Portsmouth, O.; Sweet & Doyle, Cohoes, N. Y.

Trade Notes.

ASPHALT.

The Asphaltina Construction Co., of Syracuse, N. Y., will apply to the Supreme Court of New York Feb. 28 for an order authorizing said corporation to change its corporate name to the Central City Paving Co. W. J. Gillett, president.

The Hungarian Asphalt Paving Company, Ltd., Budapest, Hungary, has awarded a contract to the F. D. Cummer & Son Co., of Cleveland, O., for a complete Cummer Semi-portable asphalt paving plant, to be erected at Budapest.

The Toledo Asphalt Patcher Co., Toledo., O., has been awarded a contract for furnishing a street repair machine to the Hugarian Asphalt Paving Company, at Budapest, Hungary.

The Merchants' Oil & Asphalt Co., Kittery, Me., has been organized with the following officers: President, Hiram Thompson, Kittery; treasurer, Ernest L. Chaney, Kittery.

BRICK.

The Purington Paving Brick Co., Galesburg, Ill., at its annual meeting Jan. 22, elected directors as follows: D. V. Purington of Chicago; Geo. C. Prussing, Chicago; Robt. Mann Woods, Chicago; Wm. E. Phillips, Galesburg; W. S. Purington, Galesburg; F. G. Matteson, Galesburg; Chas. H. Chamberlain, Galesburg. The board of directors elected the following officers: D. V. Purington, president; W. S. Purington, vice president; W. H. Terwilliger, secretary; Chas. H. Chamberlain,

treasurer. The president made the following appointments: W. S. Purington, general manager; F. G. Masterson, sales manager; Matt M. Smith, superintendent.

The manufacturing plant of the Georgia Vitrified Brick & Clay Co., at Campania, Ga., is almost completed. The main offices are in Augusta.

The Albion Vitrified Brick Co., Albion, Ill., has been incorporated and will manufacture vitrified brick, sewer pipe, cement, etc. The officers of the company are: President, Dr. J. H. Lacy; vice-president, Dr. W. H. Brosman; secretary, Walter Colver; treasurer, B. F. Nichels.

The Enid Vitrified Brick & Tile Co., Enid, Ok., has been incorporated by W. P. Redmond, G. M. Frantz and M. F. Rarey.

The Infusorial Earth Mfg. Co. is constructing a plant for manufacturing paving and other brick. The company's office is at 1604 Continental Trust Bldg., Baltimore, Md.

The Saginaw Clay Co., Saginaw, Mich., has changed its name to the Saginaw Paving Brick Co.

The Robinson Clay Product Company of Akron, O., is formed by combining the Robinson Merriell Pottery Co., The Robinson Bros. & Co., The Crown Fire Clay Co., The Royal Sewer Pipe and Fire Brick Co., The Lock Haven Sewer Pipe Co. and the Canton & Malvern Fire Brick Paving Co.

CEMENT.

William B. Shaffer of Nazareth, Pa., is conducting successful tests at Belvidere, N. J., preparatory to locating a cement plant there. The options held by Jacob V. Carter of Belvidere have been transferred to Mr. Shaffer.

The plant of the Hecla Portland Cement and Coal Company, near Bay City, Mich., is about completed and practically all the machinery has been placed. Julius Stroh, prest., Detroit.

F. T. Justice & Co., Lexington. Ky., desire to communicate with parties making a concrete mixer suitable for sidewalk work.

F. G. Schlimm, St. Mary's, Pa., desires the address of firms making concrete mixers for use in making concrete walks and floors.

A large cement plant will be established near Mauchchunk, Pa., this spring, according to press reports.

The Rochester Portland Cement Company, Rochester, N. Y., has been incorporated to deal in natural and Portland cement, lime, plaster, mineral paints, stone and building materials. The company has an option on about 500 acres of land at Kyserike, partly in the towns of Rochester and Marbletown, and a manufacturing plant will be erected at once with a capacity of 1,000 barrels per day.

The Association of Portland Cement Manufacturers, composed of twenty-five eastern companies, was formed recently in Philadelphia. The organization is for the purpose of promoting the best interests of the trade and exchanging views on the best method of manufacture. The officers are: President, R. W. Lesley of the American Portland Cement Company. vice-president, J. B. Lober of the Vulcanite Portland Cement Company; secretary, A. F. Gerstell of the Alpha Portland Cement Company; treasurer, E. M. Young of the Lehigh Portland Cement Company.

The Gypsum Cement and Plaster Company of Quanah, Tex., and the District of Columbia was incorporated at Washington, D. C., Jan. 2 to buy and sell all varieties of commodities. The incorporators are Charles W. Embrey, James A. Black and Abner E. Anson.

The Illinois Hydraulic Cement Company, Utica, Ill., has increased its capital stock from $50,000 to $70,000.

The Cuban Concrete Company, Newark, N. J., has been incorporated by Thomas R. Russum, William Lidstrom, R. Henry Calder and Charles A. Buck.

The Kalamazoo Portland Cement Company, Ltd., Kalamazoo, Mich., was incorporated Jan. 5 with officers as follows: Chairman, Stephen A. Armstrong, Celina, O.; vice-chairman, George A. Douglass, Battle Creek; treasurer, Robert B. Gordon, St. Mary's, O.; secretary, N. B. Hall, Kalamazoo.

The Buzzal-Foss Portland Cement Company, Jersey City, N. J., has been incorporated by Paul Larner, Chicago; B. Q. P. Foss, San Francisco; John F. Buzzel, Boston.

The Ventnor Concrete Company, Atlantic City, N. J., has been incorporated by Elmer E. Stanton of Grand Rapids, Mich.; H. Demer Scull and Harry I. Raup, of Atlantic City.

The Robert A. Keasley Company, New York City, has been incorporated to manufacture cement, etc., by Robt. A. Keasley, O. C. Buhrs and N. A. Brooks.

The Marden Creek Portland Cement Company, Jersey City, N. J., has been incorporated to deal in Portland and natural cement by Kenneth K. McLaren, Raymond Newman and Horace S. Gould.

The Continental Cement Company, Cassadaga, N. Y., has been incorporated.

The Penn Allen Cement Company, Allentown, Pa., has purchased two tracts of land in Bushkill and Nazareth twps., Northampton county, Pa., and has commenced work on the erection of a plant for manufacturing Portland cement. The Penn Allen Portland Cement Company is composed of Avon Barnes, S. A. Weishample, Wm. H. Gangewere, Wm. R. Yeager and Jas. K. Bowen, all of Allentown, Pa.

LIGHTING AND POWER.

The St. Joseph & Elkhart Power Company of Mishawaka, Ind., is installing a large hydraulic plant in the St. Joseph river, near Mishawaka, including power house, dam and hydraulic and electric equipment for the generation and transmission of electric power to the cities of South Bend, Mishawaka, Elkhart and adjacent territory, for general lighting and power purposes.

The St. Louis Gas & Gasoline Engine Company, St. Louis, Mo., has been incorporated by Wm. K. Jud. Otto Larson, Lillie Larson and Jacob F. Jud.

The American Public Utilities Company, Cincinnati, O., has been granted a charter at Dover, Del. It is claimed that the incorporators will now organize to centralize many small corporations, including gas, steam, heat, light and power companies of several states into one corporation.

The Detroit Edison Company of New York City has been incorporated to manufacture electricity, ice, salt, steam and other products for light, heat and power purposes. The directors are Chas. W. Wetmore, Geo. R. Sheldon, Edwin M. Bulkley, Chas. A. Coffin, Wm. F. White, Alfred Jaretski, Albert S. Ridley, Henry W. Clark and Geo. H. Olney of New York.

Newly incorporated lighting companies: Freeport Electric Company, Freeport, Ill.; Pike's Peak Hydro Electric Company, Colorado Springs, Col.; Kinney

Electric Light Display Company, Guttenberg, N. J.; Pawnee, Ok.; Mesaba Light & Power Company, Virginia, Minn.; Palestine Light & Power Company, Palestine, Tex.; Beacon Electric Light Company, Troy, N. Y.; Lehigh Light & Power Company, Camden, N. J.

The application for a restraining order enjoining the city of St. Paul, Minn., from entering into a contract with the Cleveland Vapor Light Company for the gasoline lighting for 1903 was denied December 29 by Judge Bunn of the district court. The application for a restraining order grew out of the claim of the Western Street Lighting Co., of Kansas City, Kas., that it was the lowest bidder for the lighting and that the awarding of the contract to the Cleveland Vapor Light Co. at a higher price was illegal and not in accordance with the provisions of the city charter. The court was asked to make the restraining order effective during the pending of the suit of the Western Street Lighting Company to have the contract annulled. Judge Bunn, in denying the application, makes no comments, the order filed by him containing only a denial of the application and a clause dissolving the temporary injunction granted by Judge Lewis.

The franchise of the Lansing Street Railway Company was declared forfeited Jan. 19 by the common council of Lansing, Mich., for failure to observe the requirements of its franchise and furnish proper service.

A franchise will be sold at Pasadena, Cal., February 3, granting the right to construct, operate and maintain for 25 years an electric street railroad. Heman Dyer is city clerk.

MISCELLANEOUS.

The National Lime Mfrs. Association has been organized at a meeeting in Indianapolis, Ind., in which thirty firms represents 500 kilns in Delaware, Pennsylvania, Virginia, West Virginia, Kentucky, Ohio, New York, Massachusetts, Wisconsin, Michigan, Missouri, Arkansas and Kansas were present. Officers were elected as follows: President, A. Newton, Chicago; vice-president, Peter Martin, Huntington, Ind.; secretary, F. H. Diffebaugh, Louisville, Ky.; treasurer, C. W. S. Cobb, St. Louis.

The Southern States Construction Company, Jersey City, N. J., has been incorporated by Kenneth K. McLaren, Jersey City; Frederick K. Seward, Carl H. Fowler, New York City.

The Iron Pipe and Supply Company, Trenton, N. J., has been incorporated to manufacture cast iron pipes by Wm. S. D'Avoy, Thos. McClinchey and Thos. J. McKenna.

The Bituminous Paving Company of West Virginia has filed articles in Missouri, with an office in St. Louis.

The American Water Purifying Company of Indianapolis, Ind., has been incorporated to do a general water and garbage purifying business. The incorporators are Paul Mason, Lovell B. Crabtree and Thos. C. Lewis of Indianapolis.

The Essex Cross Railway has secured a franchise in Irvington, N. J., and will proceed at once to procure the necessary right-of-way privileges. Halsey & Logan, 164 Market-st., Newark, cons. engrs.

Sealed bids are asked until Feb. 18 at Lawrence, Kas., for constructing a county court house, and for heating, plumbing and gas fitting for same. Geo. A. Flory, co. clk.

E. A. Fengler, Dubuque, Ia., contemplates the construction and operation of a macadam plant at Eagle Point.

The Bowen & Street Equipment Company, Suffolk, Va., has incorporated to manufacture, sell and exchange railway equipment for both steam and electric cars. J. E. Bowen is president; J. A. Street, vice-president; B. D. White, secretary and treasurer.

The Smalley Motor Company, Ltd., Bay City, Mich., has been organized to take over the Marine gas engine business of Smalley Bros. & Co.

The Multiple Speed & Traction Company has been incorporated to operate a moving sidewalk from Hanover-square, New York City, to the Brooklyn terminus of the new Williamsburg bridge.

The Board of Directors of the Allis-Chalmers Company at a meeting held Jan. 15, 1903, declared a regular quarterly dividend on preferred stock.

The annual report of James McLeigh, the retiring street commissioner at Newport, R. I., recommends the purchase of another steam road roller, a proper screen for the Gates crusher and some watering carts.

The Studebaker Brothers Manufacturing Company has presented the Young Men's Christian Association of South Bend, Ind., with a new home in honor of the fiftieth anniversary of the founding of the company, and a magnificent building will be erected.

An ordinance was passed at Rockville, Md., Jan. 7, declaring forfeited the charter under which the Washington & Rockville Electric Company was allowed free use of the main street of that city for its cars. The company will tear up its tracks and remove all its property from the town.

SEWER PIPE.

The Columbiana County Clay Mfg. Co. has been incorporated under the laws of Delaware by D. C. McCurdy, H. J. Lawrence and L. T. Farr. The company has secured options on clay lands in Rogers, O., and will manufacture a complete line of brick, sewer pipe, etc.

WATER.

On January 6 the United States Court of Appeals at Chicago decided for the plaintiffs in the suit of the Louisville Banking Company and others against the Indiana Water Company, the New Albany Water Company and the city of New Albany preventing the lease of the plants of the New Albany Water Company by the Indiana Water Company. The plant is again placed in the hands of the New Albany Water Company. A decision denying a receiver was rendered some days ago so that the question of the method of administering the works reverts to its original condition. The owners of the Indiana Water Company are said to own 51 per cent. of the stock of the New Albany Water Company.

Recent Inventions.

713,591. Nov. 18, 1902. Hydrant, C. L. Burkhart, Dayton, Wash., assignee of one-half to J. U. McLachlan, same city. A cylinder within the body of the hydrant, a tubular piston, a relief valve unseated by the piston when in its lowest position, and a drainage passage connected with with the relief valve whereby the water is automatically discharged when the piston is in its lowest position.

714,184. Nov. 25, 1902. Machine for molding concrete fence posts. C. H. Hutchings, Toronto, Can., assignor of two-thirds to P. W. Stanhope, same city.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Merida, Yucatan.—The principal streets are being paved with asphalt.

Wabash, Ind.—The Federal Asphalt Company will take up the rock asphalt with which it paved Main-st., from Wabash to Holliday, and relay the entire surface. The company attributes the crumbling of the asphalt after each rain to defective milling.

Cleveland, O.—The Ohio Bituminous Macadam Company is constructing 70,000 sq. yds. of bitulithic macadam pavement under Warren Bros.' patents, in Cuyahoga county. Some of the paving was completed the first of December, and all of the work will be completed this year.

Newport News, Va.—Warren Bros. have about completed the contracts for bitulithic pavement which were awarded them last spring. The Washington Asphalt Block & Tile Company has completed the paving of Jefferson-ave., Twenty-eighth-st. and Huntington-ave., which contracts were also awarded last spring.

Cortland, N. Y.—The bd. of pub. wks. enacted a resolution two years ago forbidding the construction of new plank walks and offering a rebate of 3 cts. a sq. ft. to be paid by the city on all cement walks. As a result the city expended last year $2,189.08, and more than 3 mls. of cement walks were laid.

Grand Rapids, Mich.—The bd. of pub. wks. is considering a proposition from a Cincinnati firm which offers to keep asphalt pavements in repair by a new process. It consists of replacing strips of asphalt by filling in with new material and raising the surrounding strip of pavement to such a heat that the old and the new will unite.

CONTEMPLATED WORK.

Milwaukee, Wis.—Granite paving is proposed for W. Water-st.

Baltimore, Md.—Belgian block paving is proposed for Columbia-ave.

Elgin, Ill.—The property-owners on Grove-ave. desire asphalt paving.

Helena, Mont.—The question of naming the streets is being considered.

St. Joseph, Mo.—Jule-st., from 6th to 13th, will be paved with asphalt.

Milwaukee, Wis.—Competition in asphalt paving is proposed. Mayor Rose.

Hartford, Conn.—A resolution has been passed to macadamize Roosevelt-st.

Tuscaloosa, Ala.—Contracts will be let soon for grading several streets.

Oakmont, Pa.—A resolution has been passed to pave the principal streets.

Burlington, Ia.—Plans are being prepared for paving Valley-st. with brick.

Celina, O.—Petitions are being circulated for paving Walnut and Market-sts.

Toledo, O.—Petitions are being circulated for improving a number of streets.

Boise, Idaho.—The construction of about three miles of cement sidewalks is proposed.

Mitchell, S. D.—The improvement of the alleys in the business district is contemplated.

Des Moines, Ia.—A resolution has been adopted to pave Fifth-st., from Wagner to Elm-st.

Hartford, Conn.—The macadamizing of Bonner-st. will be recommended. City engr. Ford.

Memphis, Tenn.—Estimates for paving Reyburn-ave. will be prepared by cy. engr. Omberg.

Ottawa, Kas.—The city council has voted to pave 8½ blocks of the principal streets.

Perry, Ia.—Preliminary steps have been taken for constructing two miles of cement sidewalks.

Greenfield, Ind.—The property-owners on North-st. have petitioned for cement sidewalks.

Toronto, Ont.—A sub-committee has been appointed to consider the paving of Esplanade-st.

Aurora, Ill.—The property owners on Galena and Chestnut-sts. have petitioned for asphalt paving.

Louisville, Ky.—Asphalt paving is proposed for W. Broadway from 32d st. to the Western Park.

Tiffin, O.—Plans and specifications have been adopted for paving S. Washington-st. Mayor Magers.

Toledo, O.—A petition is being circulated for paving Millard-ave. from Jessie-st. to the bridge.

Perkasie, Pa.—This town will vote on the question of issuing $8,000 bonds for street improvements.

Racine, Wis.—The estimated cost of paving Douglas-ave. with brick with stone curbing is $38,418.

New Castle, Ind.—The city council is undecided on the kind of material to use in paving S. Main-st.

Little Falls, Minn.—The question of street paving is being discussed. Jno. Vertin, member street committee.

Sioux City, Ia.—A resolution was passed January 19 to pave Jackson-st. from 5th to 30th with asphalt.

Gloucester, Mass.—The cy. council has appropriated $50,000 for paving Rogers-st. W. L. Webber, cy. engr.

Freeport, Ill.—The property-owners on Winslow, Winneshiek and State-sts. have petitioned for macadam paving.

Summerville, Ga.—This village will vote Feb. 25 on the question of issuing bonds for public improvements.

Toledo, O.—A petition is being circulated for paving Millard-ave., from Jessie-st. to the eastern city limits.

San Bernardino, Cal.—The cy. engr. has been directed to prepare plans and specifications for repaving 32d-st.

Natchez, Miss.—The question of paved streets is being considered by the mayor and council. Joe Williams, mayor.

Kalamazoo, Mich. A petition is being presented to council asking that S. Park-st. be paved with asphalt blocks.

Fulton, N. Y.—An appropriation of $100,000 for macadamizing certain roads is desired by the residents of this town.

Rockford, Ill.—The board of local improvements contemplates constructing about 27,000 feet of macadam pavement this year.

Altoona, Pa.—An ordinance is pending for paving Eleventh-ave., between Thirteenth and Bridge-sts. Harvey Linton, city engineer.

Lexington, Ky.—An appropriation of $9,000 has been recommended for repairing the brick paving on Main and Short-sts.

Battle Creek, Mich.—Bids will be asked soon for about 9,700 square yards of brick or asphalt block paving on Marshall-st.

Monon, Ind.—The White county commissioners are considering a petition for structing thirty-two miles of gravel or rock road.

Petaluma, Cal. (Special).—N. S. Frost, city engineer, has prepared plans and specifications for improving Howard and Upham-sts.

Richmond, Ind.—City Engineer Weber submitted a plan Jan. 19 for constructing a cement intersection at Seventh and A-sts.

Nashville, Tenn.—The engineering department has been asked for estimates for paving Bridge-ave. and Front-st. with granite.

Milwaukee, Wis.—A resolution was adopted Jan. 21 for building cement sidewalks on Cottage-ave. from Shelby to Linden-sts.

Bessemer, Col.—Petitions will be circulated for paving the streets with Warren's bitulithic macadam and vitrified brick.

Jerseyville, Ill.—A final hearing will be given Feb. 2 on the petition for paving Lafayette-st. between Pearl and Exchange.

St. Paul, Minn.—Asphalt paving is contemplated for Mississippi-st. Cement sidewalks are proposed in a large number of streets.

Grosse Pointe, Mich.—An election will be held Jan. 28 to decide which of two plans shall be used for macadamizing Jefferson-ave.

Logansport, Ind.—(Special)—Harry Lux desires to contract for 5,000 bbls. of Portland cement to be used in street improvements.

Menominee, Wis.—Plans were adopted Jan. 29 for paving Main-st. and Ogden-ave. with brick. Bids will be asked for immediately.

San Francisco, Cal.—The bd. of pub. wks. is considering the question of repaving Third-st. with basalt blocks. Cy. Engr. Grunsky.

Trenton, N. J.—A bill has been introduced providing for the improvement of the Newark plank road by macadamizing across the meadows.

Williamsport, Pa.—This city contemplates the construction of about 15,000 sq. yds. of brick or asphalt pavement. James F. Fisher, cy. engr.

Birmingham, Ala.—Protests will be heard Feb. 18 on the ordinance for grading, macadamizing and curbing Fifteenth-st. and avenues J, M and H.

Boston, Mass.—The council is considering an appropriation of $320,000 for paving Lamartine-st. with granite blocks and widening Hampden-st.

New York City.—The bd. of est. has decided to recommend that Delaney-st. be widened from the Bowery to the entrance to the Williamsburg bridge.

Washington, Ill.—About six blocks of Walnut-st. will be paved with brick on a gravel, concrete or crushed rock foundation. Henry Cassels, cy. clk.

St. Joseph, Mo.—Plans have been approved for macadamizing Jones, Clay, Second, Twenty-second, Charles, Michel and Landis-sts. and for brick paving on Twenty-first-st.

Red Oak, Ia.—An amended resolution has been passed to pave Third-st., from Hammond to Valley, and to extend the paving on Reed-st., from Fifth to Eighth.

Joplin, Mo.—The cy. engr. will be directed to make estimates for grading and macadamizing Broadway and Division-sts. and Missouri-ave., in East Joplin.

St. Paul, Minn.—The bd. of pub. wks. will probably readvertise for bids for paving Eagle-st., from Franklin-st. to the river, according to local press reports.

Oakland, Cal.—The street com. has recommended that the cy. engr. prepare plans and specifications for paving Tenth-st., and that Lester-ave., be macadamized.

Ashland, Wis.—The common council decided Jan. 13 to construct about one mile of new asphalt paving, and to have open specifications, so as to admit competition.

Washington, Ia.—The city council rejected all the bids for brick paving as too high and new specifications will be prepared. The lowest bid was $1.98½ a sq. yd.

Geneva, N. Y.—The resolution to make an appropriation for street paving and sewer connection was approved Jan. 21. The taxpayers will begin a hearing Feb. 11.

Ballard, Wash.—The city engineer was directed Jan. 13 to prepare an ordinance for brick paving, with granite curb and cement walks on Ballard-ave., from First to Third-aves.

Mt. Vernon, Ind.—A petition is being circulated asking the county commissioners to build 20 mls. of rick road in Robb twp. A special election will probably be ordered.

Louisville, Ky.—The board of public works decided Jan. 14 to pave Clay, Jackson, Duncan, Floyd, Franklin, Ash and G-sts. with brick and Shipp and Von Bories with asphalt.

Tacoma, Wash.—An ordinance was passed Jan. 14 for building cement sidewalks in E. Eighth, S. Ninth, S. Tenth, S. Eleventh, G and N-sts., Tacoma, Yakima, Ainsworth and Sprague-aves.

New Orleans, La.—The city engineer has been directed to prepare plans and specifications and ask for bids for repaving Canal-st., from Liberty-st. to Metairie road, with asphalt.

Schenectady, N. Y.—An ordinance has been adopted to grade, curb and pave Stanley-st. Petitions have been received for paving State-st. with asphalt and Paige-st. with block asphalt.

Riverside, Cal.—P. T. Evans, S. A. White, E. R. Skelley and F. A. Miller have been appointed a committee to secure the repaving of the business portions of Main, Seventh and Eighth-sts.

Indianapolis, Ind. — Resolutions were adopted Jan. 21 for resurfacing Washington-st., from Alabama-st. to Union Ry. tracks and Virginia-ave., from Stevens to Prospect-st., with asphalt.

Saginaw, Mich.—The cy. engr. has been directed to correspond with a number of cities and ascertain their opinions regarding the wearing properties of Warren's bitulithic macadam pavement.

Baltimore, Md.—The bd. of awards rejected the bids received Jan. 16 for grading and paving 29th-st., from Maryland to Remington-ave., and ordered the city engineer's department to do the work.

Saginaw, Mich.—The council committee on pavements decided Jan. 23 to recommend bitulithic macadam paving for Adams-st., from Niagara to Bond and Jackson-st., from Gratiot to Porter-st.

Houghton, Mich.—The main streets will be paved next summer. Maps and specifications for asphalt, vitrified brick, creosoted wooden blocks and macadam paving

have been prepared by F. W. Cappelen of Minneapolis, Minn.

Spokane, Wash. — Ordinances were passed Jan. 22 for grading, curbing and sidewalks on Chestnut-st., from Bridge-ave. to Boone-ave., and Lincoln-st., from Sharp to Indiana-ave. Otto Welle, cy. engr.

Utica, N. Y.—Resolutions for paving portions of Broad, Cooper, Miller, Hoyt and Steuben-sts. and Kossuth-ave. have been introduced, the kind of material to be designated Feb. 6. Cy. Engr. Schultze.

Denver, Col.—The bd. of public works formally created, Jan. 12, the 18th-ave. paving district, and it will be advertised according to charter provisions, until Feb. 12. The petition calls for basalt paving.

Louisville, Ky.—Plans are being prepared for reconstructing E. Jefferson, E. Market, 10th and 2d-sts. and 4th-ave. with asphalt. The west half of 18th-st., from Main to Jefferson, will be paved with brick.

Hartford, Conn.—The common council has referred to the superintendent of streets the resolutions for macadamizing Roosevelt-st., a fourteen ft.-roadway on Ward-place, and a petition for macadmizing Summit-st.

Portland, Me.—Estimates have been approved for paving Congress-st., from Merrill to Morning; for macadamizing Stevens-ave., from Pleasant-ave. to Evergreen cemetery; for macadamizing Greenleaf-st., from Oxford to Madison.

Saint Joseph, Mo.—Ordinances were passed Jan. 19 to pave Mitchell-ave., from Eighth to Fifteenth, with brick, and to macadamize, curb and gutter Robidoux, from Maine to Third. Ordinances were introduced for macadamizing several streets.

Narragansett, R. I.—The town council voted January 20 to use its influence to have the state commission on highways to construct a macadamized road on the Boston neck road, from Wickford to Wakefield, instead of on the Tower Hill road as proposed.

Newark, N. J.—Bills have been introduced in the legislature providing that $100,000 be appropriated every year for five years by the common council for paving streets and authorizing the common council to appropriate $100,000 for opening new streets.

Chicago, Ill.—The Lincoln and South Park commissioners voted to co-operate in the construction of a half mile subway, with entrances at Ohio-st. on the north and at Washington-st. on the south, as a means of communication between the north and south sides.

Essexville, Mich.—A committee has been appointed to prepare a bill to secure changes in the village charter, the most important of which will be a clause empowering the council to bond, subject to popular vote, for public improvements, including the paving of Woodside-ave.

St. Louis, Mo.—Plans for a boulevard 100 feet wide from Carondelet park to Bellefontaine cemetery, with branches running from Bellefontaine cemetery to the Chain of Rocks and O'Fallon park are nearly completed, and will soon be submitted to the King's highway boulevard commission.

Brooklyn, N. Y.—The board of local improvements has approved proposed improvements as follows: Regulating, grading and paving Bleecker-st. from Knickerbocker to Myrtle-ave. with granite block or asphalt; Pilling-st. from Evergreen-ave. to Manhattan Beach R. R. tracks, asphalt; Decatur-st. from Hamburg-ave. to Queensboro line, asphalt; Herkimer-st., from Jardine-place to Williams-place, asphalt.

Toronto, Ont.—Ordinances were passed Jan. 21 for paving as follows: Asphalt, Wilson, Spadina and Barton-aves.; brick, Harrison-st.; cement concrete pavement, Francis-st. and Manton-ave.; cedar block, Van Horn-st.; tar macadam, Wicksonave. Cement concrete walks were recommended for Smith, Murray, Ontario and Clifford-sts.

CONTRACTS TO BE LET.

Fort Riley, Kas.—Bids are asked until Feb. 16 for grading. Capt. G. O. Cress, Q. M.

Madison, Wis.—Bids are asked until Feb. 9 for paving Main-st. with asphalt. O. L. Norsman, cy. clk.

Three Rivers, Mich.—Sealed bids are asked until 7 p. m. Feb. 17 for paving Flint-ave. with brick. Jas. E. Bunn, cy. clk.

Newark, O.—Bids are asked until Feb. 10 for paving Cedar-st. with brick, with stone curbing. F. T. Maurath, cy. clk.

Columbus, Ind.—Sealed bids are asked until March 5 for repairing 3,225 square yards of asphalt paving. Wm. H. Rights, cy. engr.

Portland, Ind.—Sealed bids are asked until Feb. 4 for constructing 2¾ miles of gravel road. Jay Griffith, surv. and engr.

Springfield, Mo.—Bids are asked until Feb. 3 for 2,700 square yards of brick paving on concrete base. Geo. W. Culler, cy. engr.

Rensselaer, Ind.—Sealed bids are asked until March 4 for constructing 44,561 ft. of the South Barkley gravel road. Jas. C. Thrawls, supt.

Winnipeg, Man.—Sealed bids are asked until 8:30 p. m., Feb. 3, for furnishing 1,000 to 1,500 cords of cedar paving block. C. J. Brown, cy. clk.

Cincinnati, O.—Sealed bids are asked until Feb. 4 for paving Dela.ley-st., from Chase to Pullan-ave., with brick. Robt. Allison, prest. B. P. S.

Indianapolis, Ind.—Sealed bids are asked until 10 a. m., Feb. 9, for building 5 ft. cement walks in Moore-ave. Harold C. Megrew, chmn. B. P. W.

Chippewa Falls, Wis.—Sealed bids are asked until 2 p. m., Feb. 14, for 25,652 sq. yds. of vitrified shale brick paving. T. W. Jennings, cy. clk.

Fond du Lac, Wis.—Sealed bids are asked until 5 p. m., Feb. 23, for 19,442 sq. yds. of vitrified block paving on concrete base. E. B. Parsons, cy. engr.

Mobile, Ala.—Bids are asked until 12 m., Feb. 10, for 19,000 sq. yds. of vitrified brick paving, granite curbing, or combination concrete curb and gutter. Bd. pub. wks.

Boston, Mass.—Bids are asked until Feb. 27 for furnishing beach gravel and granite and North river flagging for cross walks during the year. Jas. Donovan, supt. sts.

Sandusky, O.—Sealed bids are asked until Feb. 4 for paving Hayes-ave. with brick, block asphalt, sheet asphalt or Warren's bitulithic macadam paving. Alex M. Wagner, cy. clk.

Boston, Mass.—Sealed bids are asked until 11 a. m. Feb. 21 for constructing roads and walks at Ft. Revere, Nantasket Head, Boston Harbor. A. M. Palmer, depot Q. M. 170 Summer-st.

Canton, O.—Bids are asked until Feb. 13 for grading, graveling, stoning and building culverts in roads in Marion, Washington, Liberty, Cessna and McDonald twps. Jas. Bastable, co. audt.

Cleveland, O.—Bids are asked until Feb. 3 for asphalt paving in Bond, Diebolt,

Fairmont, Germania and Lorain-sts.; for block stone paving in Hamilton-st.; common stone paving in Canal-st.

Brooklyn, N. Y.—Bids will be received Feb. 4 for 43,557 sq. yds. of granite paving, 5,075 sq. yds. asphalt paving, 165,436 sq. ft. of cement sidewalks, 40,855 sq. ft. of cement concrete sidewalks, 3,300 sq. ft. bluestone flagging, and 42,517 cu. yds. earth excavation. Edw. Swanstrom, boro. prest.

CONTRACTS AWARDED.

Jersey City, N. J.—The contract for paving Sevententh-st. was awarded to the M. T. Connolly Const. Co.

Terre Haute, Ind.—The contract for improving Sixth and Seventh-aves. was awarded to Roberts & Co., for $12,915.

Chattanooga, Tenn.—W. H. Brogg secured the contract for 12,000 ft. of stone curbing Jan. 6, at 39 cts. a lin. ft.

New Orleans, La.—The Louisiana Improvement Company was awarded the contract for the repair of asphalt paved streets Jan. 9.

Cincinnati, O.—H. Dieckemeier submitted the lowest bid Jan. 22 for paving Westwood-ave. from Harrison to Quebec with brick.

Birmingham, Ala.—The st. com. has recommended the award of contracts to Byron & Sanders for sidewalk improvements at $9,329 and $3,340.90.

St. Paul, Minn.—Bids were received Jan. 6 and contracts awarded Jan. 15 to the Barber Asphalt Paving Company at $1.75 a sq. yd. for asphalt paving.

Norfolk, Va.—The contract for paving Water, High, County and Court-sts. with asphalt has been awarded to the Southern Paving and Construction Company of Chattanooga.

Vicksburg, Miss.—The contract for grading Union and Grant-aves. in the National Park, a distance of 8 mis. was awarded Jan. 22 to J. T. Gross of Chattanooga, Tenn., for $29,270.

New York City.—Bids were opened Jan. 12 for repaving with asphalt on concrete in Bronx Boro., in E. 149th-st. and Crescent-ave., and for grading in Morris-ave. and Vyse-st. The award of contracts was deferred until the lowest bids were ascertained.

Salt Lake City, Utah.—(Special.)—L. C. Kelsey, cy. engr., says the contract for constructing cement sidewalks during 1903 was awarded to F. G. Palmer as follows: 1,500 cu. yds. exca., 50 cts.; 50,000 sq. ft. cement walks, 15⅞ cts. a sq. ft.; total, $8,687.50.

New York City.—The Continental Asphalt Company was awarded a contract, Jan. 16, for 763 sq. yds. of asphalt paving on the new-made land between Eighteenth and Twenty-first-sts., East river, at $2.83 a sq. yd., and 18,059 sq. yds. between piers old 20 and 16, East river, with granite at $2.15 a sq. yd.

Sioux City, Ia.—Bids were submitted Jan. 21 for paving W. Third, Sixth and Seventh-sts. with brick as follows: Seventh-st.—Hanson Bros., $1.95 a sq. yd.; M. L. Flinn, $1.93; C. F. Lytle, $2.30. W. Third-st.—Hanson Bros., $1.95; M. L. Flinn, $1.93; C. F. Lytle, $2.30. Sixth-st.—Hanson Bros. $1.95; M. L. Flinn, $1.93; C. F. Lytle, $2.30.

Buffalo, N. Y.—(Special.)—The lowest bid submitted for paving Jan. 22 were as follows: Repaving Superior-st., between Spring and Williams-st., 1,724 sq. yds., with asphalt, $2,442; with brick, $3,310; stone, $5,172. Macadamizing Fairfield-st. and Orchard-place, from Main to Vernonplace, 1,699 sq. yds., H. P. Burgard, $2,475. Repaving Spring-st., between N. Division and William-sts., 2,730 sq. yds., with asphalt, H. P. Burgard, $5,177; brick, $6,575; stone, $7,995.

Petaluma, Cal.—(Special)—N. S. Frost, city engineer, says that contracts have been awarded J. R. Nesbit as follows: Constructing 500 lineal feet basalt block curbing and broken stone gutter on Main-st., 37½ cents a lineal foot; constructing three blocks of grading, curbing and macadamizing on Third-st., 32½ cents a cubic yard for excavation; 15 cents a lineal foot for broken rock gutters; 7½ cents a square foot for broken rock gutters; 4 cents a square foot for macadamizing; $15 each for box culverts.

Hartford, Conn.—Bids were submitted Jan. 14 for improved granite curbing on Pearl-st. as follows: Hartford Paving and Construction Company, straight curb, $2.05 a lineal foot; curved curb, $2.10; H. E. Putnam, straight, $2.10; curved, $2.65; Watson & Johnson, straight, $2.13; curved, $2.64; Billings Sidewalk and Coal Company, straight, $2; curved, $2.50; the Hartford Paving and Construction company also submitted a bid on Wainwright curbing at $1.24 for straight and $1.31 for curved. The contract has not yet been awarded.

Kalamazoo, Mich.—Bids were received Dec. 27 for paving 70,000 square yards of streets with various kinds of materials. The contracts were not awarded until Jan. 17, when W. W. Hatch & Son of Goshen, Ind., were awarded contracts for 20,000 square yards of brick paving on the business portions of Portage and Water-sts. at $1.72 a square yard, for Metropolitan block for the city's portion and $1.89 for the street railway's portion. The Central Bitulithic Paving Co., Cincinnati, O., secured the contract for the remaining 50,000 square yards of paving on the residence portions of West, Main and Burdick-sts., the company to use Warren's bitulithic macadam pavement.

Toledo, O.—Bids were submitted Jan. 5 for paving Willow-ave. from Earl-st. to Navarre-ave., 3,810 square yards. O'Sullivan & Sheehan bid $1.06 a square yard for Wassal block on sand foundation and 25 cents for grading. H. G. Jennison and Wm. McMahon both bid $1.10 and Garrigan Bros. $1.12 on various kinds of vitrified paving blocks. Wm. McMahon also submitted the lowest bid for repaving Eleventh-st. from Washington to Monroe, 2,130 square yards, with Athens block at $1.58 a square yard, and 22 cents a cubic yard for grading. Bids were received Jan. 19 for repaving two sections of Eleventh-st. between Madison and Jackson-sts., and between Monroe and Madison. The lowest bid for brick paving on both sections was that of Jarrigan Bros., who bid $1.07 for Logan block on sand and $1.53 on concrete. On the section between Madison and Jackson-sts. James H. Horan offered to lay Kentucky rock asphalt at $1.80. Barber Asphalt Paving Co. bid $1.95 for Trinidad Lake asphalt. C. H. Burchinal bid $2.49 for asphalt block on concrete and $2.19 on sand.

SEWERS.

Pasadena, Cal.—More than 15 miles of public sewers have been laid within the city limits during the last twenty months.

Atlantic City, N. J.—The health board of this city filed suit, Jan. 20 against the Atlantic City Sewerage Company, charging that its method of disposal by pumping the sewage into the thoroughfare is detrimental to the health of the resort.

CONTEMPLATED WORK.

Doylestown, Pa.—A sewer ordinance is under construction.

Essexville, Mich.—The extension of the sewerage system is proposed.

Carbondale, Pa.—The construction of sewers has been recommended.

Houston, Tex.—The council is considering a revision of the sewerage system.

Peoria, Ill.—Plans for the East Bluff sewerage system have been completed.

Plymouth, Mass.—A sewerage system, including 19,765 ft. of sewers, is contemplated.

Lower Merion, Pa.—The question of issuing $250,000 sewer bonds will be voted on Feb. 17.

Toledo, O.—Plans have been approved for building a sewer between Woodruff and Grand-aves.

Baker City, Ore.—Bids will be asked for soon for building a complete sewerage system.

Wyoming, O.—The question of building the proposed $35,000 trunk sewer is being discussed.

Aurora, Ill.—About 17,400 lin. ft. of sewers is contemplated. M. G. Stolp, cy. engr.

Paterson, N. J.—The construction of an intercepting sewer 5,500 ft. long is contemplated.

Cienfuegos, Cuba—H. F. Labelle, C. E., P. O. Box 71, desires catalogues of sewer supplies.

St. Paul, Minn.—The construction of a sewer on Sherman-ave. and Oxford-st. has been authorized.

Gloversville, N. Y.—A main intercepting sewer is proposed. Charles Shafer, chmn. of the committee.

Boston, Mass.—The bd. of aldermen has passed the appropriation of $1,000 for the construction of sewers.

Lake Charles, La.—A citizens' meeting will be called Jan. 27 to lay the entire sewerage plan before them.

Jamaica, N. Y.—The construction of sewers in McNeil-ave., Davis, Starr and Lockwood-sts. is contemplated.

Athens, Ala.—The legislature will be asked to authorize a bond issue for a sewerage system for this place.

Springfield, Mo.—The construction of about 10,000 ft. of sewer is contemplated this spring. Geo. W. Culler, cy. engr.

East Syracuse, N. Y.—The village bd. and sewer comrs. are discussing plans for constructing the proposed sewerage system.

Collinwood, O.—Plans for a combined sewerage system have been submitted by Engineer Davis. Estimated cost $700,000.

Tacoma, Wash.—The comr. of pub. wks. has been authorized to create a sewerage district on S. M-st., between Twelfth and Thirteenth.-sts.

Coatsville, Pa.—The borough council will submit the question of issuing bonds for completing the sewer at Biddon's run to vote.

Champaign, Ill.—A petition is again being circulated for a brick sewer in Boneyard branch. Mayor Mullikin favors the plan.

Petaluma, Cal.—(Special.)—N. S. Frost, cy. engr. says that he has prepared plans for pipe sewers on Howard, Washington and Bayliss-sts.

Wheaton, Ill.—Plans for a sewerage and drainage system have been completed by W. H. Tarrant of Champaign. J. S. Peironnet, mayor.

Allentown, Pa.—The question of issuing $500,000 bonds for sewer improvements will be voted on Feb. 17. Geo. R. Roth, prest. coun.

Washington, D. C.—The District commissioners have approved a plan of sewerage disposal for the "Villa Flora" at the Brightwood road.

Strondsburg, Pa.—The question of building a sewerage system will be finally considered by the council Feb. 4. John J. Westbrook, boro. engr.

Hudson, Mass.—Preliminary surveys for the sewerage system have been completed and the question will be submitted to vote soon.

New Britain, Conn.—Bids for building 5 mls. of 24-in. tile sewer and 1,048 ft. of rock tunnel will be readvertised. Wm. S. Cadwell, engr.

Athens, Ga.—This city desires the services of an architect in the proposed construction of a city hall. Address J. W. Barnett, cy. engr.

Edgemere, L. I., N. Y.—The construction of a trunk sewer which will extend along the Jamaica Bay front, from Rockaway park to Norton's creek, is proposed.

The question of constructing sewerage systems is contemplated at the following places: Bryn Mawr, Pa.; Hartwell, O.; Selma, Cal.; Collinwood, O.; Plymouth, Mass.

Altoona, Pa.—Ordinances passed second reading, Jan. 16, for building a main sewer on Twelfth and Eleventh-aves., a vitrified clay pipe sewer in First-ave. and Second alley.

Flora, Ill.—The cy. coun. has authorized the employment of an engineer to prepare estimates for a sewerage system and other improvements, according to press reports.

Tulalip, Wash.—The Indian agency has been informed that the government is about to make plans for establishing a sewerage, water works and electric light plant.

Centralia, Ill.—Plans have been prepared for a sewerage system with filter beds and septic tanks, and about 54 blocks of sewers will be built now. Robt. Rohl, mayor.

Lincoln, Neb.—The cy. coun. directed Cy. Atty. Strode, Jan. 19, to draft an ordinance to submit to vote the proposition to issue $34,500 bonds for storm sewer extensions.

Grand Rapids, Mich.—The village of East Grand Rapids contemplates the establishment of a sewerage system soon and has asked for permission to connect with the local Coldbrook trunk sewer.

Pasadena, Cal.—A resolution was approved Jan. 20 for building sewers in Hudson and Franklin-aves. and Center, East and First-sts., including 26 manholes and 8 flush tanks. Heman Dyer, cy. clk.

Brooklyn, N. Y.—The Bushwick board of local impvts. adopted resolutions Jan. 16 for building sewers in Putnam-ave. with outlet sewers in Irving Place and Palmetto-st., and in Powell-st. and De-Kalb-ave.

Girard, O.—The village council held a special meeting, Jan. 16, to consider the terms of a contract for employing sanitary engineers to prepare plans, profiles, etc., for a sewerage system and sewage disposal plant.

Indianapolis, Ind.—No bids were submitted Jan. 22 for building sewers in Valley and Bloyd-aves., and bids will be asked for again. Resolutions were adopted Jan. 22 for building sewers in Oriental and Bell-sts. and Highland-place.

Newark, N. J.—The Passaic valley district sewer commission has recommended state aid for the construction of a brick sewer 2½ miles long from the Valley of Rocks in Paterson to the outlet near Robins Reef, in Newark bay.

Rockford, Ill.—The council committee on sewers has recommended that the

city engineer be ordered to prepare plans and specifications for a trunk sewer from the dam north on each side of the river as far as Market-st. on the east side and Peach-st. on the west side.

Fresno, Cal.—A proposition will be made to Mayor Stephens by H. E. Burleigh, who will agree to enter into a contract to take care of the sewage and indemnify the city against all bad effects by a sufficient bond of $5,000 or $10,000 provided the city will extend the sewer 1⅛ miles.

Chicago, Ill.—Plans for a sewerage system to drain the entire southwest portion of the city from Chicago Lawn north at a cost of $700,000, have been submitted to F. W. Blocki, commissioner board of public improvements. The plans will be presented to the Illinois and Michigan canal commissioners for further approval.

New Albany, Ind.—A bill has been introduced in the legislature providing that as this city's debt is now beyond the constitutional limit, a sewerage system be built by a company, authorized by the city council, which shall fix the price for the use of the sewers. The bill also provides for the purchase of the system when the city is able to pay for it.

CONTRACTS TO BE LET.

Jerseyville, Ill.—Bids are asked until Feb. 3 for building a sewer.

Delphos, O.—Bids are asked until Feb. 2 for constructing a sewerage system. J. W. Fisher, clk. coun.

Slayton, Minn.—Bids are asked until 7:30 p. m. Feb. 2 for building sewers. John Knutson, vil. recorder.

Fort Apache, Ariz.—Bids are asked until Feb. 5 for building a sewerage system. Lt. Col. J. W. Pope, Ch. Q. M.

Washington, D. C.—Bids are asked until Feb. 14 for constructing sewers. H. B. F. MacFarland, chmn, dist. comrs.

Boone, Ia.—Bids are asked until 2 p. m. Feb. 14 for constructing a county drain in 6 sections. Archie Patterson, co. audt.

Cincinnati, O.—Bids are asked until Feb. 9 for building a trunk sewer and drains in Observatory-ave. Robt. Allison, prest. B. P. S.

Lakewood, O.—Bids are asked until Feb. 14 for building a storm and sanitary sewerage system in Lauderdale. John French, Hamlet clk.

New Orleans, La.—Sealed bids are asked until 12 m. Feb. 2 for constructing 96 miles of brick and pipe sewers. Geo. G. Earl, gen'l supt.

Laporte, Ind.—Sealed bids are asked until Feb. 13 for constructing the Barber culvert on the township line between Michigan and Coolspring townships. Chas. H. Miller, co. audt.

Toledo, O.—Sealed bids are asked until Feb. 9 for building sewers in certain alleys and until Feb. 12 for building a pipe sewer in Genesee-st., Scottwood-ave. and an alley. Chas. N. Nauts cy. clk.

CONTRACTS AWARDED.

Harrisburg, Pa.—The contract for building a sewer in Herr-st. was awarded to John M. Bretz for $395.68.

Lawton, Ok. T.—The contract for building a complete sewerage system has been awarded to E. N. Ford of Guthrie for $21,650.22.

Milwaukee, Wis.—The contract for building track depression sewers in North and Oakland-ave. was awarded, Jan. 16, to R. J. Hickey, at $14.47 a lin. ft.

Salt Lake City, Utah.—(Special.)—L. C. Kelsey, cy. engr., says the contract for constructing 33,200 lin. ft. of sewer laterals was awarded to P. J. Moran for $39,-517.

Jersey City, N. J.—The contract for building sewers in Belmont, Gardner, Monticello, Fairview and Fairmont-aves. was awarded to Chas. O'Neill at 93 per cent. of standard prices.

Pueblo, Col.—The Holmes & Allen Pipe Construction Company was awarded the contract for constructing a three-mile ditch on the north side, connecting the pumping station with a point at Fairmount park.

Buffalo, N. Y.—(Special.)—The lowest bids received Jan. 21 for constructing brick and tile sewer were as follows: Genesee-st., from Sprenger-ave. to city line, 1,212 ft. brick and 160 ft. tile. Thos. McKeom, $3,757; 1,447 ft. tile sewers in Cable-st., Dark & Co., $2,090.

Columbus, O.—Contracts for constructing main trunk sewers were awarded, Jan. 7, as follows: Central relief system, Adams Bros., Zanesville, $81,153; Walnut-st. relief system, E. Brentlinger, Dayton, $22,669; Richard-ave. system, Lee & Casey, Pittsburg, $17,498; section A system, John E. King, Tiffin, $55,738.

WATER-WORKS.

Fond du Lac, Wis.—The Fond du Lac Water Co. has made a proposition to the city for selling its plant.

Natchez, Miss.—A resolution has been adopted to purchase the plant of the water works company.

Chattanooga, Tenn.—A bill has been introduced in the legislature providing for the issue of $700,000 bonds for the purchase or erection of water works.

New York City—Comptroller Grout submitter a report to the bd. of est. Jan. 9, recommending the immediate purchase of the property and plant of the New York & Westchester Water Supply Co., for $612,385.10.

Houston, Tex.—The city council decided, Jan. 12, to accept the proposition of the City Water Works Co. and agree to the appointment of a board of arbitration to fix the present value of the company's plant, preliminary to its purchase by the city.

Oshkosh, Wis.—The U. S. Supreme Court affirmed the decision of the lower court, Jan. 6, in the case of the Oshkosh W. W. Co. against this city. The suit was filed to compel the city to pay $5,000 hydrant rental, which the city refused to pay on the ground that the company's plant was not up to requirements. The decision was in favor of the city.

Monrovia, Cal.—The committee appointed to recommend a plan to improve the water supply has recommended, in its report to the council, that the voting of bonds be deferred for the present. The committee suggests a number of improvements, including the increase of 12-in. pipe from the reservoir to 16-in. pipe; a new pump at the sub-pumping station; improvement of mountain system, and the installation of meters.

CONTEMPLATED WORK.

Littleton, N. H.—A municipal water supply is proposed.

Cazenovia, N. Y.—The enlargement of the water works is proposed.

Dexter, Me.—Petitions are being circulated for a water works system.

Fargo, N. D.—An adequate water supply is needed, according to press reports.

Watertown, N. Y.—The bd. of water

com'rs. has decided to build a filtration plant this spring.

Oceanside, Cal.—Plans and specifications for a water works system will be prepared by J. F. Clewett.

Plainfield, N. J.—The Plainfield Water Supply Company is preparing to extend its mains to Scotch Plains.

Meridian, Miss.—The bids of aldermen and councilmen decided Jan. 15 to build a municipal water works system.

Merced, Cal.—C. E. Monroe has submitted plans and estimates for the proposed water works and electric light plant.

Ford, Mich.—An engineer will be engaged to prepare estimates of the cost of a water and electric light plant.

Cienfuegos, Cuba.—H. F. Labella, C. E., P. O. Box 71, desires catalogues of water works machinery and supplies.

Stewartstown, Pa.—This borough will let a water works contract or grant a franchise. W. H. Fulton, prest. coun.

Pomona, Cal.—The question of building a new water works system at a cost not to exceed $150,000 will be voted on.

Bangor, Me.—The Crompton fire district has voted to issue $20,000 bonds for constructing water works. W. Houston, clk. dist.

Gloucester City, N. J.—The cy. clk will be directed to advertise for bids for the contemplated improvements at the water works.

Birmingham, Ala.—J. J. Altman is chairman of a committee to investigate the advisability of building a municipal water works system.

Springfield, O.—A resolution was passed Jan. 20 authorizing the secretary of the w. w. bd. to purchase 1,200 ft. of 24-inch pipe.

Waitsburg, Wash.—The establishment of a water works system is contemplated. J. S. Guntle and W. B. Brooke, councilmen, interested.

Dunkirk, N. Y.—The bd. of water comrs. has recommended a 24-inch main in Robin-st., from the pumping station to Fifth-st. Supt. Doughty.

New Britain, Conn.—Bids will be asked the latter part of February for the proposed new 140,000,000 gal. reservoir. P. J. Egan, clk. water bd.

Apple River, Ill.—A committee has been appointed to investigate water works systems in other towns and cities preliminary to establishing one here.

Dyersburg, Tenn.—A bill has been passed by the legislature authorizing this city to issue $65,000 for water works, electric light plant and sewers.

Sayre, O. T.—This town voted, Jan. 14, to own its water works system, the supply to be secured from spring lakes, on the opposite side of Red River.

North Tonawanda, N. Y.—The Board of Public Works has been considering the building of a 24-in. water main across the Niagara River to Tonawanda Island.

Jersey City, N. J.—A resolution has been passed providing for an auxiliary pipe line under Passaic and Hackensack rivers, according to press reports.

Meadville, Pa.—An ordinance passed final reading Jan. 23 making an appropriation for the purchase of boilers for the water works pumping station.

Schenectady, N. Y.—The bd. of water comrs. has asked council to issue $318,000 bonds for increasing and improving the water supply. Geo. T. Ingersoll, supt. w. w.

The question of issuing bonds for the construction of water works has been favorably voted on at the following places: Hudson, N. Y.; Duncan, I. T.; Primghar, Ia.; Schulenburg, Tex.; St. Martinsville, La.

The question of issuing water works bonds will be voted on at the following places: Crete, Ill.; Springville, Utah, Feb. 14; Dedham, Ia., Feb. 9; Marysville, Mo.; Bonesteel, S. D.; Manning, Ia., Feb. 11; Horseheads, N. Y.; Greene, N. Y.; Windsor, Mo.

Tucumcari, New Mexico (Special)—D. J. Aber, United States court commissioner, desires the address of capitalists who would consider a water proposition. A fifty-year franchise has been granted for water works and electric light plants, but the company has no money with which to construct it.

The construction of water works systems is contemplated at the following places: Emmons, Minn.; Kenney, Ill.; Davis, I. T.; Fort Williams, Ont.; Morgan City, Utah; St. Maries, Idaho; Kingwood, W. Va.; Knox, Ind.; Fisher, Mich.; Harrisville, Mich.; Auburn, Neb.; Salix, Ia.; Lansing, Ia.; Parnell, Ia.; Oakland City, Ind.; Mountain View, Cal.; Bagley, Minn.; Chaska, Minn.; Marysville, Ia.; Thief River Falls, Minn.; Twin Valley, Minn.

CONTRACTS TO BE LET.

Lakewood, O.—Bids are asked until Feb. 14 for laying water mains. John French, hamlet clerk.

Ft. Morgan, Ala.—Bids are asked until March 1 for sinking an artesian well. A. D. Raymond, acting Q. M.

Cincinnati, O.—Sealed bids are asked until 12 m. Feb. 17 for constructing the buildings for the western pumping station, east of Lumber-st., between Eastern-ave. and the Ohio river. Aug. Herrmann, chmn. bd. trustees w. w. comrs.

CONTRACTS AWARDED.

Oakmont, Md.—A franchise has been granted Fred T. Martin and associates for a complete water works system.

San Diego, Cal.—The contract for furnishing 5,000 feet of 10-inch water pipe was awarded to Chris Froelich at $39.99 per ton.

Toledo, O.—The contract for furnishing 15,000 Trident water meters was awarded, Jan. 12, to Calvin S. Brown of this city.

Lancaster, Tex.—The contract for building a water works system has been awarded to the Municipal Construction Company of Dallas, Tex., for about $9,000.

Ardmore, I. T.—The contract for a water works system has been awarded to the American Light and Water Company of Indianapolis for about $150,000.

Salt Lake City, Utah.—(Special)—L. C. Kelsey, city engineer, says that the contract for laying 21,600 feet of water mains was awarded to P. J. Moran for $34,509.

Brooklyn, N. Y.—The contract for laying a 30-in. c. i. force main in Underhill-ave. was awarded, Jan. 8, to Isaac Harris for $28,565.04, and for furnishing, delivering and laying water mains in large number of streets, $133,934.60.

Pittsburg, Pa.—The United States Oil and Gas Well Supply Company of this city has secured a contract for furnishing water works supplies for Nome and Dawson City for about $100,000. The contract includes machinery, valves, pipe and fittings.

Kansas City, Mo.—The contract for a 25,000,000 gal. centrifugal turbine pump for Quindaro station was awarded to Henry R. Worthington of New York for $27,274. The engineers disagreed on the type of engine for Turkey Creek station and the contract was not awarded.

Long Island City, N. J.—The contract for laying the Astoria water mains was awarded, Jan. 8, to Norton & Dalton for $32,697.40. The contracts for the distrib-

uting mains, including 11¼ miles of 6 to 14-in. iron pipes was awarded to Frederick N. Lewis for $32,364.92.

Schenectady, N. J.—The contract for 600 water meters was awarded as follows: National Meter Company, New York City, 50; Neptune Meter Company, New York City, 200; Hersey Mfg. Company, Boston, 100; Union Meter Company, Worcester, Mass., 50; Pittsburg Meter Company, Pittsburg, 50; Thompson Meter Company, New York City, 50.

Louisville, Ky.—Bids were received Jan. 20 for 30,000,000 and 24,000,000 gal. pumping engines for the Louisville Water Company from R. D. Wood & Co., Camden, N. J.; Kilby Mfg. Company, Cleveland, O.; Holly Mfg. Company, Buffalo, N. Y.; Allis-Chalmers Company, Chicago, Ill.; and Milwaukee, Wis. The bids range from $375,000 to $396,800 for a 30,000,000 gal. pump to $317,845 to $344,400 for a 24,000,000 gal pump.

BRIDGES.

Scottsdale, Pa.—A bridge across Jacobs Creek will be built in the spring.

Brownsville, Pa.—A county bridge between this city and West Brownsville is contemplated.

Spencer, Ind.—Bids are asked until Feb. 3 for building three small iron bridges. Holt Pickens, chmn.

Brownsville, Pa.—A petition is being circulated for building a bridge between this city and West Brownsville.

New Castle, Ind.—Bids are asked until Feb. 9 for constructing five steel bridges and one steel arch bridge.

Evansville, Ind.—The county commissioners have approved plans and specifications for building five small bridges in German township.

Bay City, Mich.—Bids are asked until Feb. 14 for reconstructing the floor system of the Lafayette-ave. bridge. Bloomshield & McCloy, cons. engrs.

Athens, Tenn.—The McMinn county court authorized Jan. 6 the building of an iron bridge in the Fourteenth district over the Conasauga creek.

Seattle, Wash.—An ordinance has been introduced to appropriate $3,000 to rebuild two 24-ft. bridges across the ravine between Twelfth and Fourtenth-sts.

Plainwell, Mich.—A bill was passed in the legislature Jan. 20 authorizing the twp. bd. of Gun Plains, Alleghany co., to issue bonds for building a bridge over the Kalamazoo river.

Camden, N. J.—Sealed bids are asked until 11 a. m. Feb. 11 for building a drawbridge over Cooper's Creek at Baird-ave. Jas. D. Wilkinson, chmn. bridge com. John J. Albertson, co. engr.

Bloomfield, Ind.—The contract for building a bridge across Plummer creek was awarded to Geo. M. Notter at $2,065 for bridge and $274 for substructure, and $128 for a stone arch.

Muscatine, Ia.—Bids are asked until Feb. 3d for furnishing all metal for bridges needed by the county during 1903; also for erecting same bridges, except flooring. A. C. Noble, co. audt.

Springfield, Mass.—A more substantial bridge is proposed to replace the present wooden structure over the tracks of the Highland division of the N. Y., New Haven & Hartford R. R. at St. James-ave.

Scranton, Pa.—(Special.) — Joseph P. Phillips, ch. engr., says that the contract for constructing the W. Lackawanna-ave. viaduct was awarded Jan. 12 to Burke Bros. of Scranton, for $57,624.90.

Indianapolis, Ind.—Plans will be prepared for a stone, a concrete and a bridge of steel girders across Fall creek at College-ave. A stone bridge will be given the preference if the $80,000 appropriation is sufficient to build it.

South Bend, Ind.—(Special.)—A. J. Hammond, cy. engr., under date of Jan 21, says bids will be received within the next ten days for a street viaduct over the M. C. tracks at Niles, Mich., for the South Bend & Southern Michigan Railway Company.

Huntington, Ind.—(Special.)—Contracts will be let in February for building three bridges, as follows: One at Wabash across Salamonie river; one 2 mls. southeast of this city across Wabash river; one at Andrews across Wabash river. Malone Smith, co. engr.

Buffalo, N. Y.—(Special.)—A hearing was given Jan. 20 by a sub-committee of the Interstate and Foreign Commerce Committee on the bill to authorize the Mather Power Bridge Company to construct in the Niagara river, at or near Buffalo, an experimental span for a power bridge. Permission has already been granted by the state of New York.

STREET LIGHTING.

Newark, N. J.—The board of works will make a new lighting contract in March.

Manheim, Pa.—Local capitalists propose to install an electric light plant.

Vernon, N. Y.—A stock company is being formed to build another electric light plant.

Wallace, Tenn.—The establishment of an electric light plant at his mill is proposed by Col. W. S. Waste.

Ft. Dodge, Ia.—The Ft. Dodge Light and Power Company will expend $275,000 to $400,000 in improving its plant.

Ft. Wayne, Ind.—This city is considering a proposition to grant a franchise for a hot water and steam heating plant.

Rayne, La.—Bids are asked until Feb. 2 for constructing an electric light plant. Wm. Mackintosh, cons. engr., Jennings, La.

Manistee, Mich.—G .A. Hart of this city has asked the council for a franchise for a gas, electric lighting and heating plant.

Merrill, Wis.—Sealed bids are asked until 7:30 p. m. Feb. 3 for lighting the streets and public buildings. B. J. Lambert, cy. clk.

Hannibal, Mo.—Mayor Arnold has appointed R. H. Settles, W. T. Perkins and R. H. Graham a committee to investigate electric lighting.

Lewisburg, Tenn.—The contract for a new system of electric lights has been awarded the Braid Electric Light Company of Nashville, Tenn.

Rangoon, Burmah—Bids are asked until June 12 for an electric light and power project. Address W. Slaicore, secy. of Rangoon municipality.

The question of issuing electric light bonds has been favorably voted on as follows: Nicolett, Minn.; Sellersville, Pa.; Twin Valley, Minn.

Winona, Minn.—The contract for constructing the municipal lighting plant was awarded, Jan. 19, to W. I. Gray & Co. of Minneapolis for $44,890.

Knightstown, Ind.—A 100 H. P. Walrath gas engine is being installed in the municipal plant for electric lighting service to replace the steam plant.

Atlanta, Ga.—Geo. Hillyer, president water commissioners, suggests the establishment of an electric light plant at Hemphill water stations for lighting the public buildings.

The question of issuing bonds for building electric light plants will be voted on as follows: Pelican Rapids, Minn., Mar.; Elmore, Minn., Mar.; Rushville, Ill., Mar. 10.

Three Rivers, Mich.—The contract for lighting this city was awarded, Jan. 14, to the Constantine Hydraulic Co., of Constantine, Mich., at $60 per light for ten years.

Redkey, Ind.—A franchise has been granted the Union Electric Light Co., of Indianapolis, to establish a plant here. This city agrees to take 20 arc lights at $25 per year.

Manila P. I.—Sealed bids are asked until May 4 for a street railway, light and power franchise. Clarence R. Edward, Col. U. S. Army, ch. of Bureau of Insular Affairs, War Dept., Washington, D. C.

Galva, Ill.—The cy. council voted to light this city with electricity. A committee of N. A. Carlson, J. J. Lord, J. N. Kingdon and E. M. Haines visited Naperville recently to inspect the plant there.

Portsmouth, O.—The Merchants' Heating, Light & Power Company has been incorporated and will establish an electric light plant here. Wm. E. Anderson, Felix Haas, Leon Ersinan, Wm. Burt and Wm. Nye are interested.

Escanaba, Mich.—The Escanaba Lighting Company is in the market for 2 dynamos, 2 rheostats, 1 switchboard, 100 meters, 2 tons of wire, 1 engine, 1 pump, 1 belting, 10 transformers, 2 boilers and 1 heater. C. E. Smith, mgr.

Rockland, Me.—The cy. coun. voted Jan. 5 not to renew the 5-yr. contract for street lighting with the Rockland and Camden Company at $100 per light per year, but to offer the company $75 per light, and if this offer is not accepted to ask for bids for a municipal plant.

Muncie, Ind.—The city council is in a quandary over its electric light plant. The present one is inadequate, and the city is bonded more than the constitutional limit so that it cannot build a new one. It is probable that a contract will be given a private company.

The question of constructing electric light plants is contemplated at the following places: Elmer, Pa.; Lake Preston, S. D.; Smithfield, N. C.; Beloit, Wis.; Burlington, Wis.; Mexico, Mo.; Venus, Tex.; Louisville, Col.; Athens, Wis.; Middletown, Pa.; Beloit. Wis.; Richfield, Utah.

PARKS.

St. Paul, Minn.—Plans were discussed at the annual meeting of the water board Jan. 9 for the establishment of a general park system.

Charleston, S. C.—The city park commissioners contemplate the development of the old Washington race course, which has been purchased, into a park.

Kansas City, Mo.—The Southwest Improvement association approved Jan. 16 the proposition to issue bonds to finish the parks.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Syracuse, N. Y.—The plant of the Syracuse Reduction Company burned Jan. 18, entailing a loss of about $45,000.

Atlantic City, N. J.—The question of having street cleaning and sprinkling done by contract is being considered.

Tacoma, Wash.—The question of sprinkling the principal and residence streets is being considered.

Natchez, Miss.—Sealed bids are asked until 4 p. m. Feb. 5 for cleaning, keeping in repair, etc., of certain streets, alleys and lanes. W. G. Benbrook, mayor.

Jacksonville, Fla.—S. L. Earle, st. supt. will communicate with inventors and manufacturers of street cleaning machines that do the work by means of compressed air.

St. Louis, Mo.—Bids were received Jan. 12 for sprinkling the streets during 1903. The contracts are divided into 54 districts and the aggregate cost of the work in all districts is $199,000, which is $33,000 less than it was in 1902.

Kansas City, Mo.—The committee, composed of Dr. Langsdale and Aldermen Miers, Tyree and Umbarger, appointed to negotiate for the erection of a crematory for the incineration of the city's garbage, has deferred the opening of bids for 30 days.

FIRE APPARATUS.

Lincoln, Neb.—The council has voted to purchase a hook and ladder truck.

Grand Forks, N. D.—Bids are asked until 7:30 p. m. Feb. 2 for a steam fire engine first and second size, of 900 and 700 gallons capacity per minute. F. A. Brown, city auditor.

TOO LATE FOR CLASSIFICATION

Monticello, Wis.—The village board of trustees will consider an electric light franchise Feb. 4.

St. Paul, Minn.—A trunk sewer for the West Side on State-st., from Texas-st. to the river, is contemplated.

Alexandria, Ind.—W. J. Overman, cy. engr., is investigating garbage furnaces with a view to establishing one here.

Richmond, Va.—The question of a new and additional crematory in the eastern section of the city is being considered.

Trenton, N. J.—Sealed bids are asked until 8 p. m. Feb. 2 for concrete walks, granite curbing, etc. Wm. Roberts, chmn. park comrs.

Wabash, Ind.—The question of constructing an electric light plant is being investigated by F. McLees, cy. clk.

Le Roy, N. Y.—The water and lighting commissioners held a meeting Jan. 21 to consider the question of obtaining a supply of water for this village.

Williamson, W. Va.—A franchise for water works and electric lights was awarded Jan. 24 to Capt. M. F. Moll and Capt. W. E. Doe of Marietta.

South McAlester, I. T.—Bids will be received until Feb. 14 for pipes, hydrants and machinery for the new water works. Fielding Lewis, mayor.

Wheeling, W. Va.—The Bellaire Electrical Co. has been incorporated by J. A. Armstrong, J. W. Corbett, W. L. Smith, H. L. Hesse and Andrew Armstrong.

Indianapolis, Ind.—Plans for a complete sewerage system for Irvington are being prepared by City Engineer Nelson, who expects to have the system completed by the end of next summer.

Cincinnati, O.—The contract for building a sewer in Slack-st. was awarded Jan. 24 to E. S. Gleason for $1,998.80. The city engineer was directed to prepare plans for a sewer in Liddell-st.

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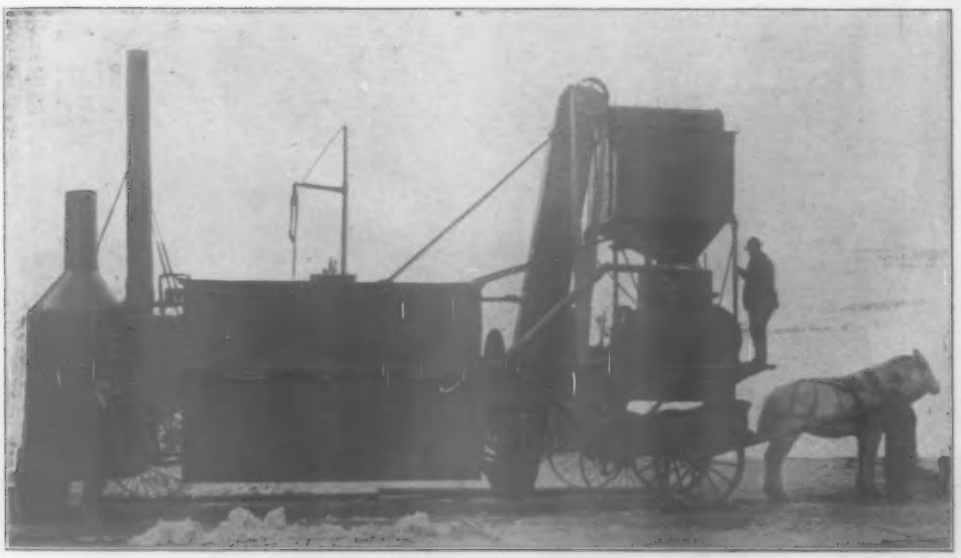

Patented July 18, 1902; September 6, 1902

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